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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

LXXXII

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By M. L. FERNALD

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXXII

I. THE GENUS OXYTROPIS IN NORTHEASTERN AMERICA

M. L. Fernald

(Plates 171–175)

Oxytropis is so preëminently a genus of western North America and Eurasia that its occurrence in the northeastern section of North America has been looked upon as exceptional. With us it reaches its southern limit at about latitude 47°, though one species extends (along the St. John River) southward beyond 46°; but the material now accumulated shows that practically one-sixth of the North American species are found east of longitude 85° W. (on Melville Peninsula, Southampton Island, Baffin Island, the Labrador Peninsula, Newfoundland or the Gaspé Peninsula) and, since every recent expedition to an unexplored section of this area has brought back one or more additional species, it is probable that, when the region is better known, the number of species of *Oxytropis* in eastern America will be considerable. The situation in *Oxytropis* (and similarly in *Astragalus*) is quite parallel with that in such genera as *Salix*, *Epilobium*, *Antennaria*, *Arnica* and *Taraxacum*. In 1864 (DeCandolle's Prodromus) Andersson recognized 19 species of *Salix* in this area; we now know more than 40. In 1891 Trelease recognized in the region 7 species of *Epilobium;* we now know 20. In the Synoptical Flora, in 1878, Gray recognized in the area 4 species of *Antennaria*, 2 of *Arnica* and 1 (indigenous) of *Taraxacum;* today we know 23 of *Antennaria*, 10 of *Arnica* and 8 of *Taraxacum*. That the development of our knowledge of *Oxytropis* in northeastern America is parallel

with these cases is indicated by the facts that in 1884, in his *Revision of the North American Species of the Genus Oxytropis*, Gray definitely recognized in the area east of longitude 85° only 2 species but today we know at least 10; and, as stated, every competent expedition into new territory in the region may be counted upon to secure others.

In restudying the eastern American material, much of which is of my own collecting, it has been found necessary, in light of more abundant material, greatly to alter the old interpretations based on inadequate specimens; and during this review, the necessary study of close allies from farther west has shown some cases in which we have misinterpreted the identities. These new interpretations are, consequently, here recorded and several of the new species are illustrated by photographs generously supplied by Professor J. Franklin Collins. Since finishing the work upon the material in the Gray Herbarium I have had the great advantage of seeing the remarkable series of specimens in the National Herbarium at Ottawa,[1] most kindly placed at my disposal by Dr. Malte. In order to bring to date our knowledge of the group the following is offered as

A Synopsis of Oxytropis in Eastern America

a. Stipules nearly free from the petioles: flowers and fruits reflexed, the latter becoming secund: corolla violet, at most 1 cm. long.....1. *O. foliolosa.*

a. Stipules strongly adnate to the petioles: flowers and fruits ascending or spreading, not secund: corolla violet, purple, white or yellow, 1–2 cm. long....*b.*

b. Loosely or densely cespitose, but hardly pulvinate: principal leaves 0.3–3 dm. long, with 11 or more green (but often silky) leaflets: scapes 0.15–3.3 dm. high: spikes (except in obviously dwarfed individuals) 3–many-flowered....*c.*

c. Leaflets opposite, subopposite or alternate, not verticillate (except in aberrant leaves)....*d.*

d. Inflorescences viscid or glutinous; the bracts and legumes often verrucose....*e.*

e. Leaves mostly 1–2 dm. long, with 30–35 thin leaflets: scapes 0.5–1.7 dm. high: spike many-flowered, 2–5 cm. long: flowers and fruits strongly ascending: calyx white-villous: corolla yellowish-white, with a purple spot on the keel.....2. *O. gaspensis.*

e. Leaves 2–6 cm. long, with 19–33 thick leaflets: scapes 1.5–4.5 cm. high: spike subcapitate, 1.5–2.5 cm. long: flowers and fruits spreading: calyx black-villous: corolla purple.....3. *O. hudsonica.*

d. Inflorescences not obviously viscid; bracts and legumes not verrucose....*f.*

[1] In this synopsis specimens seen by me only in the National Herbarium of Canada are designated by "(Can)."

f. Marcescent stipules very bristly-ciliate: pubescence of scapes divergent....*g.*
g. Corolla yellow or yellowish-white: legume ovoid: stipules castaneous, glabrous on the back, with prolonged linear-lanceolate tips.....4. *O. Maydelliana.*
g. Corolla violet: legume oblong-cylindric: stipules whitish, pubescent, abruptly short-acuminate.5. *O. arctica.*
f. Marcescent stipules sparingly if at all ciliate, mostly eciliate or merely with few terminal bristles: pubescence of scapes mostly appressed: corolla purple or violet....*h.*
h. Free blades of stipules 0.6–1.8 cm. long: leaves 0.5–3 dm. long, with leaflets 0.6–3 cm. long: scapes 0.5–3.3 dm. high: spike (except in obviously dwarfed plants) elongating, several–many-flowered, 2–11 cm. long: bracts lanceattenuate, 5–11 mm. long, herbaceous, strongly pubescent on the back: calyx-teeth lanceolate, 1.5–3 mm. long: vexillum 7–10 mm. broad: seeds as high as long.....6. *O. johannensis*
h. Free blades of stipules 2–7 mm. long: leaves 2–9 cm. long, with leaflets 2–8 mm. long: scapes 0.15–1.2 dm. high: spike subcapitate, few-flowered, 1.5–3 cm. long: bracts lanceolate to elliptic, obtuse or acute, 3–5 mm. long, subchartaceous, glabrous or sparingly pubescent: calyx-teeth deltoid, 0.5–1.5 mm. long: vexillum 5–8 mm. broad: seeds longer than high....7. *O. terrae-novae.*
c. Leaflets (or many of them) verticillate, 2, 3 or 4 together..8. *O. Belli.*
b. Densely cespitose or pulvinate: principal leaves 0.5–3 cm. long, with 5–11 white-pubescent minute leaflets: scapes filiform, 0.5–2 cm. high: flowers 1 or 2, violet....*i.*
i. Foliage white-villous; leaflets oblong or narrowly obovate: legume sessile within the calyx, linear- to oblong-subcylindric, subcoriaceous, 2–3 cm. long, 4–5 mm. in diameter.....9. *O. arctobia.*
i. Foliage white-silky; leaflets linear or linear-lanceolate: legume distinctly stipitate within the calyx, inflated, ovoid, membranaceous, 1.5–2 cm. long, 7–12 mm. in diameter.....10. *O. podocarpa.*

1. O. FOLIOLOSA Hook. Acaulescent, with multicipital caudex: leaves numerous, strongly divergent or subascending, 2–9 cm. long; stipules lanceolate, pilose; petiole and rachis filiform, pilose; leaflets 15–29, in approximate pairs, narrowly ovate, obtuse or subacute, 2–8 mm. long, appressed-pilose: scapes 2–15 cm. high, pilose: spike compact, subglobose to ovoid, 1–3 cm. long, with the 2–10 flowers at first ascending, later divergent and finally reflexed and secund: bracts linear-lanceolate, pilose, short: calyx campanulate, black-pilose; the tube 2.6–3.5 mm. long, truncate at summit, about equaled by the lance-subulate lobes; the sinuses rounded and broad: corolla deep-violet, but whitish at base, 8–10 mm. long; the vexillum 4.5–5 mm. broad; the obtuse keel with a conspicuous straight or recurving cusp: legumes reflexed, stipitate within the calyx, subcylindric, 1–1.5 cm. long, 3–4 mm. in diameter, black-hirsute.—Fl. Bor.-Am. i. 146

(1834); Fernald, Rhodora, xxviii. 103, 105, 106, 216 (1926). *O. foliosa* Torr. & Gray, Fl. N. A. i. 339 (1838). *O. deflexa* Gray, Proc. Am. Acad. vi. 236 (1864), in part, ibid. xx. 1 (1884), in part; Bunge, Mém. Acad. Imp. Sci. St. Pétersb. sér. 7, xxii. 39 (1874), in part; not DC. (1802). *Aragallus foliolosus* (Hook.) Rydb. Mem. N. Y. Bot. Gard. i. 256 (1900).—Rocky Mountains from Yukon to high summits of Colorado; Hudson Strait, Quebec; Pistolet Bay, Straits of Belle Isle, Newfoundland. The following are the collections from eastern America. Ungava District, Quebec: "Northern Labrador," *A. P. Low*, no. 18,668 (Can); gravelly seashore, Wakeham Bay, Hudson Strait, *Malte*, no. 118,334. Newfoundland: dry gravelly limestone barrens, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,599; dry limestone gravel, Schooner (or Brandy) Island, *Pease & Long*, no. 28,600; sandy and turfy upper border of limestone beach, Cook Point, *Fernald & Gilbert*, no. 28,601.

O. foliolosa closely simulates the arctic-alpine *O. lapponica* (Wahlenb.) J. Gay of Eurasia but is distinguished at once by its less connate stipules with much narrower and longer free blades. By Gray and by Bunge as well as by many recent authors it has been merged with the Siberian *O. deflexa* (Pall.) DC. and its Rocky Mountain representative, *O. retrorsa*,[1] but it differs from them both in its compact

[1] Oxytropis **retrorsa**, n. sp., *O. deflexam* simulans; calycis dentibus lanceolatis 4–5 mm. longis approximatis sinubus acutis.—Saskatchewan and southern Alberta to New Mexico. Type from Colorado: meadows, vicinity of Como, South Park, August 3, 1895, *Crandall & Cowen*, no. 152, in Gray Herb.

This is the plant regularly passing in America as *Oxytropis deflexa* (Pall.) DC. or as *Aragallus deflexus* (Pall.) Heller. *O. deflexa*, however, was based upon *Astragalus deflexus* Pall. Acta Acad. Petrop. ii. 268, t. 15 (1779). In his Species Astragalorum, 33, t. xxvii. (1800), Pallas changed the name to *A. retroflexus* but made no material alteration and his beautiful plate shows the plant of Transbaikalia with calyx-tube truncate, with broad rectangular sinuses between the short and setaceous teeth. Material of authentic *O. deflexa* from Transbaikalia in the Gray Herbarium exactly coincides with Pallas's descriptions and plates and shows that the America plant with lanceolate, approximate calyx-lobes and acute sinuses has been erroneously referred to it.

Typical *Oxytropis retrorsa*, when well developed, has the stems elongate, with 2–5 internodes, the pubescence sordid and villous, the calyx 7–9 mm. long and fuscous- or black-pubescent, the petals bluish at apex. In more northern or more alpine situations it becomes acaulescent or subacaulescent, with more silvery pubescence, smaller leaves, pale calyx only 3.5–5.5 mm. long and paler corolla, often merely white. This is the plant which was called by Torrey & Gray *O. deflexa*, β *sericea*. In its extreme form it seems abundantly distinct from the larger *O. retrorsa* but so many intermediates occur that it is best treated as

O. retrorsa, var. **sericea** (Torr. & Gray), n. comb. *O. deflexa*, β. *sericea* Torr. & Gray, Fl. N. A. i. 342 (1838). The following are characteristic. Yukon: Carmacks, Yukon River, *Eastwood*, no. 573. Alberta: Laggan, *J. Macoun*, no. 65,069; vicinity of Basin, *S. Brown*, no. 807; gravelly soil, Banff, *Moodie*, no. 1278. Montana: Suksdorf Gulch, northwest of Wilsall, *Suksdorf*, no. 215. Idaho: Wildhorse Creek, Custer Co., *Eggleston*, no. 14,023; moist grassy lands, Mackay, Custer Co., *Nelson & Macbride*, no. 1426. Wyoming: bars of Gros Ventre River, Jacksons Hole, *Merrill & Wilcox*, no. 963. Utah: slope of Aquarius Plateau, *L. F. Ward*, no. 457.

Outside Siberia and North America *Oxutropis deflexa* has been reputed to grow only in arctic Norway (Finmark). It is there very rare, at a single mountain-station

habit, closely aggregated flowers, the spike not elongating as in *O. deflexa* and *O. retrorsa,* and larger and deeper colored corolla, its inflorescence very closely matching that of *O. lapponica.* In its calyx it is closer to the latter species and to the Siberian *O. deflexa* than to the Rocky Mountain *O. retrorsa.*

2. O. GASPENSIS Fern. & Kelsey. PLATE 171. Acaulescent: leaves strongly ascending; leaflets 30–35, oblong or oblong-lanceolate, mostly obtuse, 0.8–1.3 cm. long, 2–5 mm. wide, thin, herbaceous, loosely strigose-villous on both surfaces and somewhat viscid (staining pressing-paper yellow): scapes 0.5–1.7 dm. high, shorter than or scarcely exceeding the leaves, silky-pilose with white hairs: spikes dense, in anthesis 2–3 cm. long, in fruit 3–5 cm. long: bracts lanceolate, herbaceous, 5–10 mm. long, viscid, sometimes verrucose: flowers numerous, ascending: calyx campanulate, white-villous; the tube 4–5 mm. long; the teeth deltoid, viscid, 1–2 mm. long: corollas yellowish-white, 1–1.2 cm. long, purple-maculate on the keel: legume short-ovoid, 1–1.3 cm. long, abruptly acuminate, viscid and white-villous, chartaceous, nearly 2-celled: seeds reniform, 1.6–2 mm. long.—RHODORA, XXX. 123 (1928).—Known only from Gaspé Co , QUEBEC: on exposed cliffs along the Gaspé coast, Mont Louis, August 10, 1882, *J. Macoun,* no. 5343 (Can), distributed as *O. campestris;* talus of slaty cliffs, Mt. St. Pierre, near mouth of Rivière à Pierre, *Fernald & Smith,* no. 25,874, distributed as *O. viscida* Nutt.; same locality, Rivière à Pierre, *Kelsey & Jordan,* no. 96.

An eastern American representative of *O. viscida* Nutt. and *O. viscidula* (Rydb.) Tidestrom; in its viscid quality approaching these violet-flowered species. Also very similar to *O. gracilis* (A. Nels.) K. Schum., but with shorter scapes, denser spikes and characteristic viscidity.

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where it was discovered by Norman in 1883 and misidentified as *O. lapponica.* It was later separated by Dahl in Blytt, Norges Fl. ed. Dahl, 466 (1906) as *O. deflexa,* but said to differ from the Siberian plant in its shorter stem, fewer leaflets, shorter and black-hairy calyx and white-hairy young pods ("Vor form adskiller sig fra sibiriske eksamplarer isaer ved kortere stengel, faerre smaablade, mere kort- og sorthaaret baeger og de unge belges hvide haar-beklaedning, men stemmer i disse karakterer med Bunges beskrivelse af nord-amerikanske former."). Subsequently, in 1926, Carl Th. Mörner (Svensk Bot. Tisdkrift, xx. 344), reviewing the discovery of the Finmark plant, emphasized that all the earlier collections, by Norman in late August, 1883 and by Dahl in August, 1903, when the plant was first identified as *O. deflexa,* and again in 1913 and 1915, showed fruit and that Dahl's description of the corolla as violet was an assumption. Mörner, visiting the station earlier, in July, found the plant in flower, the corollas white, not violet, and thus departing from the violet or bluish flowers usually described from Siberia and western America. I have seen no Finmark specimens but its short stem, shorter calyx, white corollas and white-pubescent legumes suggest *O. retrorsa,* var. *sericea;* but the black-hairy calyx is not characteristic for the latter plant.

3. O. **hudsonica** (Greene), n. comb. Plate 172. Acaulescent: stipules broadly ovate, acuminate, glutinous, bristly-ciliate and hirsute: leaves 2–8 cm. long; leaflets 19–33, thick, oblong, 2–4 mm. long, with strongly elevated ciliate margins, glabrous above, pilose to glabrate beneath: scapes 1.5–4.5 cm. high, viscid-villous: spike subcapitate, 1.5–2.5 cm. long, of 6–16 spreading flowers: bracts oblong-lanceolate, 4–10 mm. long, firm, glutinous and commonly verrucose, more or less black-hairy: calyx campanulate, black- (or white-) hairy; the tube 4–6 mm. long; the teeth deltoid, 1–2 mm. long: corollas purple (drying bluish), 1.2–1.7 cm. long; the vexillum about 6 mm. broad: legume slenderly ovoid; the body 1.5 cm. long, tapering to a long straight beak, pilose and glandular-verrucose.—*Aragallus Hudsonicus* Greene, Proc Biol. Soc. Wash. xviii. 17 (1905).—About Hudson Bay and westward to Mackenzie District. Quebec: along the east coast of Hudson Bay, Great Whale River, *A. P. Low*, no. 14,272 (type no.);[1] north of Cape Jones, *Low*, no. 63,166. Keewatin: Chesterfield Inlet, *J. W. Tyrrell*, no. 101,050, Nat. Herb. Can. (Can); Rankin Inlet, *J. M. Macoun*, no. 79,104. Ontario: sandy soil, Fort Severn, *J. M. Macoun*, no. 5344, as *O campestris* (Can). Mackenzie Distr.: Artillery Lake, *J. W. Tyrrell*, no. 23,150 as *O. campestris*, var. *caerulea* (Can); west shore, Great Bear Lake, *J M. Bell*, no. 22,895 as *O campestris*, var. *caerulea* (Can).

4. O. Maydelliana Trautv. Acaulescent: stipules marcescent, castaneous or fulvous; the free blades glabrous, ovate, tapering to elongate linear-lanceolate bristly-ciliate or finally glabrate tips: leaves 3–10 cm. long, strongly ascending; the 11–17 elliptical to lanceolate obtuse to acute leaflets 3–12 mm. long, sericeous or glabrate beneath (and rugulose upon drying), commonly somewhat sericeous above: scapes 0.3–1.5 dm. high, villous and more or less appressed-pilose: spike subcapitate, 1.5–3.5 cm. long: bracts lanceolate, 4.5–7 mm. long, black-hairy, sometimes with pale hairs intermixed: calyx campanulate, densely black-villous (or sometimes with longer pale hairs); the tube 4–5 mm. long, with lance-deltoid black-hairy teeth 0.5–2 mm. long: corolla yellow or yellowish-white, 1–1.4 cm. long; the vexillum 4–5 mm. broad: legume ovoid, with the distended body about 1.3 cm. long and narrowed abruptly to a long straight beak.—Acta Horti Petrop. vi. 16 (1879); Kjellman, Vega Exped. Betensk, Arb. i. 523(1882). *O. campestris* var. ξ. *melanocephala* Hook. Fl. Bor. Am. i. 147 (1834); Torr. & Gray, Fl. N. A. i. 341 (1838); Ostenfeld, Vasc. Pl. Arct. N. Am. Gjöa Exped. 20, t. ii. fig. 12 (1910); Fernald, Rhodora, xxv. 113 (1923). *O. leucantha* Gray, Proc. Am. Acad. xx. 5 (1884), in part; Macoun, Cat. Can. Pl. i. 510 (1886);

[1] Greene originally cited no. 14,272, distributed from the Geol. Surv. of Canada, as collected by *A. P. Low*, and such a sheet, with *Low* given as collector, is in the Gray Herbarium. In the National Herbarium of Canada the specimen of same locality, date and number bears a label in the handwriting of the late John Macoun, but the collector is given as *Spreadborough*.

not *Astragalus leucanthus* Pall. Sp. Astrag. 59, t. 47 (1800). *O. campestris*, var. *sordida* Macoun & Holm, Can. Arct. Exped. v. Bot. Pt. A. 16a (1921), in part, not Willd.—Arctic and subarctic America and Chukches Land in adjacent northeastern Asia. The following are definitely referable here. BAFFIN ISLAND: gravel beaches above tundra, Arctic Bay, Admiralty Inlet, *Malte*, no. 118,340; gravelly hill above tundra, Pond Inlet, Eclipse Sound, *Malte*, no. 118,337; rocky knolls by seashore, Lake Harbor, *Malte*, no. 118,338; Bowdoin Harbor, *Ralph Robinson*, no. 14; *Soper*, no. 837 (Can); Cape Dorset, *Soper*, nos. 745, 783 (Can). UNGAVA DISTRICT, QUEBEC: Erick Cove, Hudson Strait, *A. P. Low*, no. 22,991; crevices of rock, Digges Island, Hudson Strait, September 15, 1884, *Robt. Bell*. KEEWATIN DISTRICT: Wager Inlet, *J. M. Macoun*, no. 79,103. KING WILLIAM LAND: Gjöa Harbor, July, 1904, *Godfred Hansen* (Can). MACKENZIE DISTRICT: Bathurst Inlet, *R. M. Anderson*, no. 592 (Can); south coast of Coronation Gulf, *Cox & O'Neil*, nos. 399 and 399[a] (Can); old specimen in Gray Herb., received from Herb. Hooker, labeled "Drummond, *Ox. campestris*, Polar Sea," with the pertinent note added by Gray: "If 'Polar Sea,' then not 'Drummond'"; "Parry's Voyage," material mixed with *O. arctica*, sent to Asa Gray from Herb. Benth. as *O. arctica* R. Br.; an identical specimen sent the Gray Herbarium, without name, from the British Museum as coll. on Parry's 2d voyage. YUKON: Herschell Island, *Frits Johansen*, no. 234[a] (Can). ALASKA: Cape Nome, 1900, *Blaisdell*.

It is impossible, without seeing the actual specimens, to accept as positively belonging to *O. Maydelliana* all the Arctic American material cited by different authors as *O. campestris*, *O. campestris*, var. *sordida*, *O. campestris*, var. *melanocephala* and *O. leucantha*. This difficulty is due to the fact that there is another plant with yellow flowers in Arctic America which has been passing as *O. campestris*, vars. *sordida* and *melanocephala*. This is shown by *Frits Johansen's* no. 332 (Herb. Geol. Surv. Can. no. 98,415) from Bernard Harbor, by *Girling*, nos. 690 and 691 (Can) from Clifton Point (west end of Dolphin and Union Strait) and by *Jenness*, no. 368 (Can) from Wollaston Land. This plant has yellow and comparatively small corollas and small calyx with short teeth, thus closely simulating *O. Maydelliana;* but its stipules are pale, thin and densely pubescent, instead of castaneous, chartaceous and glabrous. The firm and castaneous old stipules are very conspicuous in all the specimens above cited as *O. Maydelliana* and these characters have been emphasized by all who have studied it. Thus, in the original description and discussion of *O. Maydelliana*, Trautvetter said: "stipulis . . . glabris, longe setoso-ciliatis, rigidulis, herbaceis, demum fuscis et pergameneis"; Macoun,

calling the common plant *O. leucantha*, said: "Specimens very distinct; stipules chestnut colored and conspicuous" and Ostenfeld, treating it as *O. campestris*, var. *melanocephala*, "a very remarkable form of *O. campestris*" which "merits perhaps to be reckoned as a separate species," said "It differs from *O. campestris* . . . in . . . old stipules 'chestnut coloured and conspicuous' . . . —this is a very distinct character." Ostenfeld further states that the plants of Chuckches Land brought back by Kjellman "agree exactly both with the description of *O. Maydelliana* TRAUTV. (they have been so named by KJELLMAN . . .) and with the authentic specimens of *O. campestris*, var. *melanocephala* Hook., and I feel sure therefore that the two names are merely synonyms."

The Johansen, Girling and Jenness material with whitish and densely pubescent scarious stipules probably belongs to *Oxytropis borealis* DC. Prodr. ii. 275 (1825), described, like *O. Maydelliana*, also from Chuckches Land ("terra Tschuktschorum") and regularly taken by Asa Gray to be identical with his "*O. leucantha.*" De Candolle's description was brief but hardly applicable to *O. Maydelliana*, for it had the diagnostic character "Stipulae pallidae."

5. O. ARCTICA R. Br. PLATE 172. Acaulescent: stipules membranaceous or scarious, whitish-villous, persistent; the free blades deltoid, tapering to lanceolate tips: leaves 2–7 cm. long, with 11–17 oval or oblong villous-sericeous or finally glabrate leaflets 2–6 mm. long: scapes 2.5–7 cm. high, villous with variously mixed black, sordid or pale hairs: spike subcapitate, 2–5-flowered: bracts linear-lanceolate, black-villous: calyx slenderly campanulate, densely black-hairy; the tube 5–6 mm. long; the linear teeth broadened at base, erect or divergent, black-hairy, 1.5–2.5 mm. long: corolla violet, 1.6–2 cm. long; the vexillum 4–7 mm. broad: legume oblong-cylindric, incompletely 2-celled.—App. Parry 1st Voy. 278 (1823); Gray, Proc. Am. Acad. xx. 4 (1884) in part; Simmons, Phytogeogr. Arct. Am. Archipel. 112 (1913). *O. arctica*, α *subumbellata* Hook. Fl. Bor.-Am. i. 146 (1834). *Spiesia arctica* (R. Br.) Kuntze, Rev. Gen. 206 (1891). *Aragallus arcticus* (R. Br.) Greene. Pittonia, iii. 211 (1897).—MELVILLE ISLAND, *Sabine, Edwards, Ross.* MACKENZIE DISTRICT: between Coppermine River and Cape Alexander, *Rae.*

Oxytropis arctica has been reported from several stations within our area, but I have seen no material from the Hudson Bay area, the Labrador Peninsula or the region of the Gulf of St. Lawrence. Macoun (Cat. Can. Pl. i. 115, 509) recorded it first as *O. uralensis*, var. *pumila* Ledeb., later as *O. arctica*, from St. Paul's Island, Nova Scotia (*McKay*), and from Digges Island, Hudson Strait (*Bell*); Britton &

Brown, Ill., Fl. ed. 2, ii. 389 cite it from "Shores of the Gulf of St. Lawrence; Hudson Strait, Hudson Bay, and along the Arctic sea-coast"; and among the numerous stations given by Simmons is Southampton Island (in Hudson Bay). In his account of the collections of Melville Island, Robert Brown gave only one *Oxytropis*, his new species *O. arctica*, with "*Caules* . . . basi stipulis villosissimis persistentibus imbricatis tecti. . . . foliola 11–17 . . . . Stipulae membranaceae, . . . apicibus solutis semilanceolatis . . . . *Scapi* . . . villosi . . . . *Capitulum* 3–5-florum . . . . *Calyx* villis nigris subadpressis copiosis tectis, dentibus erectis brevibus. *Corolla* caeruleo-violacea, calyce duplo longior (9–10 lin. aequans)," etc. In the Melville Island collections of Parry's Voyage in the Gray Herbarium there are three species: a violet-flowered plant with pale stipules and subumbellate spike such as was described by Brown; a yellow-flowered plant with castaneous stipules, *O. Maydelliana;* and the densely cespitose white-villous *O. arctobia* Bunge. Others have already noted the fact that Brown overlooked the presence in the Melville Island collection of more than one species; but I have here restricted my interpretation of *O. arctica* to the violet-flowered plant from which the original description was obviously drawn.

In regard to the occurrence of *O. arctica* about Hudson Bay, Hudson Strait and the Gulf of St. Lawrence, all specimens I have seen from these areas prove to be something else. No material of *Oxytropis* from St. Paul's Island in the Gulf of St. Lawrence is known. In answer to my inquiry regarding his reputed collection of it Dr. A. H. McKay once wrote me that he collected no material, but merely made a tentative field-identification of the plant seen. Since no *Oxytropis* is known about the Gulf of St. Lawrence except in the Gaspé region and in western Newfoundland (all together four species) it is highly important to secure good material of the plant of St. Paul's Island. The Digges Island plant collected by Bell and distributed as *O. arctica* is partly *O. Belli*, partly *O. Maydelliana*, and other Hudson Bay specimens distributed by the Geological Survey of Canada as *O. arctica* are *O. hudsonica*, one of them (*Low*, no. 14,272) being the type-collection of that species.

6. O. **johannensis** (Fernald), n. comb. PLATE 173. Acaulescent: stipules whitish, membranaceous, villous-hirsute when young, becoming glabrate or merely bristly-ciliate at tip; the lanceolate to ovate free blades 0.6–1.8 cm. long: leaves 0.5–3 dm. long; petiole and rachis appressed-pubescent; the 15–31 linear-lanceolate to oblong leaflets

0.6–3 cm. long, 1–6 mm. broad, from densely sericeous to glabrate: scapes 0.5–3.3 dm. high, appressed-pubescent: spike several–many-flowered, elongating and loose in maturity, 2–11 cm. long: bracts lance-attenuate, 5–11 mm long, herbaceous, silky-villous on the back with pale hairs, sometimes with black ones admixed, becoming glabrate: calyx silky-villous with pale or dark hairs; tube campanulate, 5–7 mm. long; teeth lanceolate, pubescent, 1.5–3 mm. long: corolla 1.5–2 cm. long, purple or purple-violet (rarely whitish); the vexillum 7–10 mm. broad: legumes strongly ascending, rather firm, thick-cylindric to obliquely lance-ovoid, 1.5–2 cm. long, tapering to a straightish beak, almost 2-celled, appressed-pubescent with black, white or mixed hairs: seeds black, obliquely round-reniform to cordate-ovate, as high as broad, 1.8–2 mm. broad.—*O. campestris*, var. *Johannensis* Fernald, Rhodora, i. 88 (1899). *Aragallus johannensis* (Fernald) Heller, Cat. N. A. Pl. ed. 2: 7 (1900). *O. Lamberti* α Hook. Fl. Bor.-Am. i. 147 (1834), the plant of *Lady Dalhousie*, *Mrs. Percival* and *Mrs. Sheppard*. *O. Lamberti* δ ? Torr. & Gray, Fl. N. A. i. 339 (1838); Gray acc. to Goodale, Prelim. Rep. Nat. Hist. & Geol. Me. (1861) 366. *O. uralensis* β. Gray acc. to Goodale, l c. (1862) 125, not Torr. & Gray. *O. campestris* Gray, Proc. Am. Acad. vi. 235 (1864), as to Maine plant and Man. ed. 5: 133 (1867); Britton in Britton & Brown, Ill Fl ed. 2, ii. 390 (1913), as to plant of Quebec, Maine and New Brunwick; not DC. *O. campestris*, var. *caerulea* Gray, Proc. Am. Acad. xx. 6 (1884), as to plant of Maine and Lower Canada; Wats. & Coult. in Gray, Man. ed. 6: 137 (1889) in part; not Koch. *O. Lamberti*, var. *sericea* Fernald in Hay, Bull. Nat. Hist. Soc. N. B. xii. 69 (1894) and Proc. Portl. Soc. Nat. Hist. ii. 79 (1895), not Gray. *Spiesia campestris* Britton in Britton & Brown, Ill. Fl. ii. 308 (1897), as to plant of Quebec, Maine and New Brunswick, not Kuntze.—Western Newfoundland, eastern Quebec, New Brunswick and northern Maine. Newfoundland: turfy and gravelly shelves, crests or talus of diorite, Ha-Ha Mountain, Ha-Ha Bay, *Pease & Griscom*, no. 28,602; Ha-Ha Point, *Fernald & Long*, no. 28,603; dry limestone cliffs and talus, western face of Doctor Hill, Highlands of St. John, *Fernald & Long*, no. 28,605; conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, *Fernald & Wiegand*, no. 3633; high sea-cliffs, Chimney Cove, July 18, 1895 and August 13, 1896, *Waghorne;* headlands, Green Gardens, Cape St. George, *Mackenzie & Griscom*, no. 11,054 (dwarf extreme); some material from Table Mountain, Port-à-Port Bay suggests a mixture of this and the next species. Quebec: Bonaventure conglomerate (calcareous) sea-cliffs, Bonaventure Island, Gaspé Co., *Fernald & Collins*, no. 1110, *Victorin, Rolland-Germain, Brunel & Rousseau*, no. 17,251; banks of Grand River, Gaspé Co., June 20–July 10, 1903, *Geo. H. Richards*, June 30–July 3, 1904, *Fernald;* ledgy banks of Restigouche River, Matapedia, June 28, 1904, *Fernald;* limestone and limestone-conglomerate ridges from Pointe aux Corbeaux to Cap Caribou, Bic,

Fernald & Collins, nos. 1107, 1108; crevices and talus of limestone-conglomerate sea-cliffs, St. Fabien, *Fernald & Collins*, no. 1109; Isle d'Orleans, *Mrs. Sheppard*, 1864, *Brunet*, 1922, "rare," *Rolland*, no. 16,130. NEW BRUNSWICK: Nepisiguit River, *Fowler;* mouth of Tobique River, *Hay;* rocky bank, Aroostook Falls, *Hay*, no. 5342 (Can); crevices of calcareous ledge, Gorge of Aroostook River, Andover, July 17, 1902, *Williams, Collins & Fernald;* crevices of rock by St. John River, Woodstock, *J. Macoun*, no. 21,166 (Can); gravelly island in the St. John River, Upper Queensbury, *Fernald & Pease*, no. 25,168; islands of St. John River, Fredericton, *L. W. Bailey.* MAINE: on the St. John near Seven Islands, 1861, *Goodale;* shores of the St. John, August 22, 1879, *Pringle;* rocky islet in St. John River, St. Francis, July 20, 1900, *E. F. Williams;* everywhere on gravelly and sandy river-beach, Fort Kent, June 5, 1898, *Fernald*, no. 2289 (TYPE in Gray Herb.); St. John River, Fort Kent, *Pease*, nos. 2347, 2348; sandy or gravelly shores, St. John River, Grand Isle, *Fernald* no. 2290; gravelly shore, St. John River, Van Buren, *Fernald*, no. 25.

Although generally treated as *O. campestris* (L.) DC. or at most as a variety of it, *O. johannensis* is abundantly distinct. *O. campestris* of Europe (chiefly continental) has strongly ciliate stipules, leaves nearly glabrous, with 8–11 pairs of leaflets, scapes rarely becoming more than 1.5 dm. high ("fructifer . . . 2–5-pollicaris, raro longior"—*Bunge*), spike subcapitate, not elongating, corolla ochroleucous. In fact, Bunge distinguished *O. campestris* from the other species of the section (with silky-villous leaves, more numerous leaflets and purple flowers) by the key characters: "Virens, glabrescens, folia 8–11-juga, flores ochroleuci." *O. johannensis*, on the other hand, has the stipules only slightly if at all ciliate, the leaves silky-villous when young (and often to maturity), leaflets mostly 10–15 pairs, scapes in fruit up to 3.3 dm. high, spike elongating and loose in maturity and corolla (except in rare albinos) purple or purple-violet. Although, like *O. campestris*, it belongs to the Section *Diphragma*, it is scarcely conspecific with it.

7. O. **terrae-novae**, n. sp. (PLATE 174), acaulis laxe caespitosa sparse pubescens glabrata virens; stipulis breviter petiolaribus alte connatis, laminis liberis membranaceis deltoideis acuminatis 2–7 mm. longis glabris vel glabratis uninerviis eciliatis vel ad apicem sparse ciliatis; foliis 2–9 cm. longis, petiolis rhachibusque sericeo-pilosis, foliolis 6–12-jugis lanceolatis vel ellipticis 2–8 mm. longis 0.5–4 mm. latis sparse sericeo-pilosis vel glabratis; scapis adscendentibus vel divergentibus 0.15–1.2 dm. altis sericeo-pilosis; spicis subcapitatis paucifloris 1.5–3 cm. longis; bracteis lanceolatis vel ellipticis obtusis vel acutis 3–5 mm. longis subchartaceis glabris vel sparse pilosis; calycibus campanulatis

membranaceis nigro-pilosis parciusque albo-villosis, tubo 4–6 mm. longo, dentibus deltoideis 0.5–1.5 mm. longis; corollis purpureis vel violaceis; vexillo 1.2–1.5 cm longo lamina obcordata 5–8 mm. lata; leguminis angusto-ovoideis tumidis nigro-pilosis breviter cuspidatis rostro excluso 1.2–1.7 cm. longis subbilocularis; seminibus nigrescentibus reniformibus 1.8–2.2 mm. latis 1.5–2 mm. altis.—*O. uralensis*, γ *minor* Hook. Fl. Bor. Am. i. 146 (1834), as to Labrador plant of Morrison. *O. campestris* Gray, Proc. Am. Acad. vi. 235 (1864), in part; Britton in Britton & Brown, Ill Fl. ed. 2, ii. 390 (1913), as to plant of Labrador and Hudson Strait; not DC. *O. sordida* (as to plant of Labrador) Bunge, Mém. Acad Imp. Sci. St. Pétersb. sér. 7, xxii. no. 1: 83 (1874), not Pers. *O. campestris*, var. *caerulea* Gray, Proc. Am. Acad. xx. 6 (1884), as to Labrador plant; Fernald, Rhodora i. 87 (1899); not Koch. *Spiesia campestris* Britton in Britton & Brown, Ill. Fl. ii. 308 (1897), as to plant of Labrador and Hudson Strait, not Kuntze.—Western Newfoundland, eastern Labrador and the Hudson Strait region of Quebec. Newfoundland: turfy and rocky slopes of Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 28,617; dry crests of trap cliffs, Anse aux Sauvages, *Fernald, Wiegand & Long*, no. 28,604; turfy limestone barrens, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,609; dry limestone gravel, Schooner (or Brandy) Island, *Pease & Long*, no. 28,611, turfy limestone barrens, Cook Point, *Fernald & Gilbert*, no. 28,610; dry rocky and gravelly limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 28,612, 28,613; turfy limestone barrens, Four-Mile Cove, no. 28,614; dry heath-barren near Mile Brook, west of Big Brook, *Long & Gilbert*, no. 28,608; by the sea-shore, Poverty Cove, July 16, 1920, *M. E. Priest;* peaty and turfy slopes, limestone barrens, Sandy (or Poverty) Cove, *Fernald, Long & Dunbar*, no. 26,809; dry turfy limestone barrens, Savage Point, *Fernald, Wiegand, Pease, Long, Gilbert & Hotchkiss*, no. 28,606; limestone barrens, Anchor Point, *Wiegand, Gilbert & Hotchkiss*, no. 28,607; peat on dry gravelly limestone barrens, St. John Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,615 (type in Gray Herb.), 28,616; limestone barrens, Pointe Riche, *Fernald & Wiegand*, no. 3634; dry limestone barrens, upper slopes and tablelands, alt. 200–300 m., Table Mountain, Port-à-Port Bay, *Fernald & Wiegand*, no. 3635, *Fernald & St. John*, no. 10,848, *Mackenzie & Griscom*, no. 10,331; Green Gardens, Cape St. George, *Mackenzie & Griscom*, no. 11,009. Labrador: crevices of rock, Cape Chudleigh, August 5, 1884, *R. Bell;* on granitic rock under 760 m., Razorback Mt., Ryan's Bay, *R. H. Woodworth*, no. 292; on granitic rock at Head of Main Arm of Ekortiarsuk Bay, *Woodworth*, no. 292½; on granitic cliffs at 150–600 m., Head of Nachvak Bay, *Woodworth*, no. 291; on granitic rock, Kikkertasoak Island, Saglek Bay, *Woodworth*, no. 290; on granitic rock under 150 m., Head of North Arm of Saglek Bay, *Woodworth*, no. 293; Port Manvers, July 18, 1926, *C. S. Sewell & A. C. Weed;* sandy soil near the beach,

Nain, *J. D. Sornborger*, no. 33; Indian Harbor, *Ralph Robinson*, no. 98; Battle Harbor, *Bowdoin College Exped.* no. 91; barren hill-top, Square Island, *J. A. Allen*, no. 37; Red Bay, *Bowdoin College Exped.* no. 23. UNGAVA DISTR., QUEBEC: Port Burwell, *Soper*, no. 946 (Can); Ungava Bay, 1884, *L. M. Turner;* Fort Chimo, *A. P. Low*, no. 16,300; sand, Cape Prince of Wales, August 21, 1884, *R. Bell.*

Oxytropis terrae-novae is the little plant with crimson or purple-violet flowers which has been generally passing as *O. campestris*, var. *caerulea* Koch. This misidentification seems to have started when Bunge, with only scanty material, suggested that the Labrador plant might belong to *O. sordida* (close to if not quite identical with Koch's *O. campestris*, var. *caerulea*). But that Bunge was not wholly satisfied with such disposition of it is indicated by his discussion. Correctly defining *O. sordida* as a large-flowered plant of the Arctic, with "floribus leucophaeis," vexillum "saepe 5′′′ lata" etc. he added a comment on the Labrador plant:

"Huc etiam trahenda videtur planta labradorica, quamvis pluribus notis abhorrens; gracilior et omnibus partibus minor. Bracteae breviores vix calycis tubum dimidium attingentes. Flores violacei. Calyx 3–4′′′ longus dentibus brevibus triangularibus. Vexillum 6–7′′′ longum, lamina obcordata 2½–3′′′ lata. Alae 5′′′ parum excedentes. Carinae mucro brevissimus. Ovarium 17–23-ovulatum. Legumen oblongum ovatumve, tumidum, breviter cuspidatum, 7′′′ tantum longum, interdum vix semipollicare, rectiusculum, nigro-pilosissimum. Caetera congruunt. An nihilominus species proprii juris? An forsan sequenti [*O. Lamberti*] adjungenda?"—Bunge, l. c. 83.

Bunge's distinctions prove constant and there is no doubt that *O. terrae-novae* is quite distinct from *O. sordida*. Gray, in 1864, had called the Labrador plant *O. campestris* but there is no material in the Gray Herbarium of such early date. In 1884, with a single collection before him (whereas we now have 39 collections and much field-experience with the plant), he called it (along with *O. johannensis*) *O. campestris*, var. *caerulea:* "These are the only American stations I can cite for *O. campestris*, taking that species to comprise *O. sordida*. And as our specimens have clear violet or blue corollas, when not pure white . . . , I adopt Koch's name given to the quite similar form in Europe." The flowers are crimson or purple-violet (blue only after drying) but *O. campestris*, var. *caerulea* Koch, Syn. 181 (1838) is merely a form of the normally yellow-flowered continental European *O. campestris* in which the flowers have some blue colora-

tion. In no other character does it seem to differ from *O. campestris* (see discussion under *O. johannensis*) and it is surely not the plant so characteristic of Newfoundland and Newfoundland Labrador.

8. O. Belli (Britton) Palibine. Acaulescent, with many crowns: stipules membranaceous, whitish; the free portions ovate, acuminate, whitish-villous or in age glabrate: leaves 0.3–1.7 dm. long, loosely ascending, the petiole and rachis loosely white-villous; leaflets in verticils of 2, 3 or 4 or sometimes opposite or subopposite, oblong to lanceolate, 3–10 mm. long, loosely villous: scapes 0.3–1.7 dm. high, villous: spike subcapitate, 3–10-flowered, 1.5–4 cm. long: bracts herbaceous, lanceolate, black-hairy, 5–10 mm. long, divergent: calyx campanulate, black-villous and often with longer white hairs; the tube in anthesis 8–10 mm. long; the black-hairy lanceolate teeth 1.5–3 mm. long: corolla violet, 2–2.3 cm. long; the vexillum 6–8 mm. broad: legume lance-cylindric, rather thin-walled, pubescent with black hairs or with longer white ones, nearly or quite 2-celled, the body 1.2–2 cm. long below the straight and recurved beak: seeds round-reniform to cordate-ovate, olivaceous, 1.5–1.9 mm. broad.—Bull. Soc. Bot. Genève, sér. 2, ii 19 (1910) as *O. Bellii;* as *O. Bellii* (Britton) J. M. Macoun in Low, Cruise of Neptune, 1903–04: 320 (1906), name without proper bibliographic citation; as *O. Bellii* (Britton) J. M. Macoun in Bernier, Rep. Dom. Can. Govt. Exped. D. G. S. 'Arctic,' 1908–09, App. B, 489, 490, with plate (1910); as *O. Bellii* Simmons, Phytogeogr. Arct. Am. Archipel. 111 (1913); Britton in Britton & Brown, Ill. Fl. ed. 2, ii. 391, fig. 2568 (1913). *Spiesia Belli* Britton in J. M. Macoun, Can. Rec. Sci. vi. 148 (1894), as "*Spiesia Oxytropis Belli*"; Britton in Britton & Brown, Ill. Fl. ii. 309, fig. 2162 (1897). *Aragallus Belli* (Britton) Greene, Pittonia, iii. 212 (1897).—Shores of northern Hudson Bay; perhaps farther west. Ungava District, Quebec: rocky places, Digges Island, *R. Bell,* no. 1164 (type of *Spiesia Belli*), distributed as *O podocarpa,* changed to *O. arctica* (Can); Keewatin District: Fullerton, *L. E. Borden,* no. 62,933, *J M. Macoun,* no. 79,105; Depot Island, 1894, *Geo. Comer;* Chesterfield Inlet, *J. W. Tyrrell,* no. 62,543 (Can), *L. T. Burwash,* nos. 119,028, 119,029, 119,031, 119,032 (Can); Rankin Inlet, *J. M. Macoun,* no. 79,106.

For a remarkably distinct species *Oxytropis Belli* had a most unconventional introduction to botanical recognition. Originally published by the late J. M. Macoun as "*Spiesia Oxytropis Belli,* Britton, n. sp." (1894), it later appeared without discussion or bibliographical citation in a list by J. M. Macoun (1906) as "*Oxytropis Bellii,* (Britt.)," this constituting its first, but quite unsatisfactory enumeration under *Oxytropis,* with the spelling of the specific name altered. In 1897 Britton himself had taken it up as *Spiesia Belli* and in the same year

Greene correctly retained the same (original) spelling of the specific name in *Aragallus Belli* Greene. The first proper transfer to *Oxytropis* was by Palibine under date of February 28, 1910. This was followed later in the year (letter of transmittal dated April 5, 1910) by the listing by J. M. Macoun of "*Oxytropis Bellii* (Britton), Macoun" and the publication of a beautiful plate of the plant (drawn obviously from Borden's flowering material from Fullerton, with fruit from the type, collected on Digges Island by Bell). This plate in Macoun's Appendix to the Bernier Report bears the simple inscription at bottom "*Oxytropis Bellii*, (Britton.)" but loose copies of the plate, intended for use in another but never published work, have been distributed with the printed heading "Geological Survey of Canada Plate XI" and the name at the bottom "*Oxytropis Bellii*, Britton"; while on some of the herbarium specimens the author of the combination is given as Holm. From these notes it is apparent that the real authorship of the combination has been doubtful; but, in view of his properly making the transfer, it should be ascribed to Palibine.

The Appendix to Bernier's Report is entitled: "List of Plants Collected by Mr. J. G. McMillan on Melville Island, in the Autumn of 1908 and Early Summer of 1909";[1] and Macoun there speaks of McMillan's finding on Melville Island "*Oxytropis Bellii*, described from specimens collected on Mansfield Island by Dr. Bell;" and Simmons, accordingly, cites it as occurring on these two islands. The original material came, of course, not from Mansfield Island, but from Digges Island, as correctly stated in the original description published by Macoun; and the McMillan plant from Melville Island preserved in the National Herbarium at Ottawa belongs to a characteristic species[2] of western Arctic America with non-verticillate leaflets

[1] The Report and the Appendix are very rare in American libraries and I am indebted to the kidness of Dr. Malte and of the Geological Survey of Canada for the temporary loan of a copy.

[2] Oxytropis **coronaminis**, n. sp. (Plate 175), acaulis laxe caespitosa pubescens virescens; stipulis petiolaribus alte connatis, laminis liberis membranaceis deltoideis acuminatis dense longeque sericeo-villosis villis flavescentibus; foliis 2–9 cm. longis, petiolis rhachibusque flavido-villosis, foliolis 5–9-jugis anguste oblongis vel lanceolatis 3–10 mm. longis sericeo-villosis; scapis 1–9 cm. altis pilosis; spicis subcapitatis 2–4-floris, floribus divergentibus; bracteis lanceolatis, divergentibus 5–9 mm. longis nigro-pilosis; calycibus campanulatis membranaceis nigro-pilosis parciusque albo-villosis, tubo 7–9 mm. longo, dentibus lanceolato-linearibus 3–6 mm. longis; corollis purpureis vel violaceis 2–2.7 cm. longis, vexilli lamina rotundata obovata valde obcordata 1.2–1.7 mm. lata.—Region of Coronation Gulf, Mackenzie District, Victoria Island and (much smaller) on Melville Island. Mackenzie District: Arctic seacoast, *Richardson* (type in Gray Herb.); Kent Peninsula, August 13, 1926, *W. H. B. Hoare* in Nat. Herb. Can. no. 119, 027a, as *O. arctica;* Epworth Harbour, south coast of Coronation Gulf, July 4, 1915, *Cox & O'Neil*, no. 393 (Can) (no. 98,407 Herb. Geol. Surv. Can.), July 15, 1915, *Cox & O'Neil*, no. 395 (Can) (no. 98,408 Herb. Geol. Surv. Can.); Bernard Harbour, July 19, 1915, *Frits Johansen*, nos. 321*a*, 321*b* (Can) (nos. 98,405 and 98,406 Herb. Geol. Surv. Can.), July, 1915, *R. M. Anderson*,

and other characters which at once remove it from *O. Belli* of the Hudson Bay area.

9. O. ARCTOBIA Bunge. Densely cespitose or pulvinate, very densely white-villous: stipules adnate high on the petioles, the free tips subherbaceous, deltoid, silky-villous: leaves with 3–4 pairs of crowded often folded oblong to obovate white leaflets 1–3 mm. long: scapes scarcely exceeding the leaves, 1–2-flowered, white- or black-villous or with mixed hairs: bracts solitary or paired, herbaceous, villous, about 1 mm. long: calyx densely black-villous, often with some white hairs admixed; the tube in anthesis 5–6 mm. long; the lanceolate blunt teeth 2–3 mm. long: corolla purple or violet; the obcordate vexillum 8–10 mm. long, 6–8 mm. wide: legume sessile, subcylindric, 2.5–3 cm. long, short-acuminate, subcoriaceous, softly white-pubescent with an admixture of black appressed hairs, nearly 2-celled.—Mém. Acad. Imp. Sci. St. Pétersb. ser. 7, xxii. no. 1: 114 (1874); Ostenfeld, Vasc. Pl. Coll. Arct. N. Am. Gjöa Exped. 19, t. 2, fig. 14 (1910); Simmons, Surv. Phytogeogr. Arct. Am. Archip. 112 (1913); Macoun & Holm, Can. Arct. Exped. 1913–18, V. pt. A, 17A, tt. ii. fig. 2 and ix. figs. 4 and 5 (1921); Fernald, RHODORA, xxv. 113 (1923). *O. arctica*, var. *uniflora* Hook. App. Parry 2d Voy. 396 (1825). *O. arctica*, β. *minor* Hook., Fl. Bor.-Am. i. 146 (1834). *O. nigrescens*, var. *arctobia* (Bunge) Gray, Proc. Am. Acad. xx. 3 (1884); Macoun, Cat. Can. Pl. i. 509 (1886).—Subarctic and Arctic America from Hudson Strait, Baffin Island to Melville Island, Victoria Island and Mackenzie. BAFFIN ISLAND: Bowdoin Harbor, *Ralph Robinson*, no. no. 114,022 (Can). VICTORIA ISLAND: Wollaston Land, August, 1915, *D. Jenness*, no. 387 (Can) (no. 98,404 Herb. Geol. Surv. Can.). MELVILLE ISLAND: Winter Harbour, July 6, 1909, *J. G. McMillan*, no. 77,294 (Can) as *O. Belli*.

Oxytropis coronaminis has been confused with *O. Belli*, *O. arctica* and *O. Roaldi* Ostenf. The McMillan plant from Melville Island formed the basis for Macoun's report of *O. Belli* from there; the Richardson material has been cited as *O. arctica* and Hoare's plant taken for it; the others, of recent collection, form the bases of the records of *O. Roaldi* in the Report of the Canadian Arctic Exped. V. Pt. A. 17A where (t. viii. fig. 2) the species was illustrated (with 5-flowered spikes, although the specimens in the National Herbarium of Canada show only 2–4) as *O. Roaldi*, Ostenf. Vasc. Pl. Arct. N. Am. Gjöa Exped. 54, t. iii. fig. 16 (1910). The latter is known, however, only from Hershell Island, Yukon. The type was collected by the Gjöa Expedition and the Canadian Arctic Expedition of 1913–16 secured an excellent collection of it, *Frits Johansen*, no. 234 (Can), which was included in the Report of the Canadian Arctic Exped. (p. 16A) under *O. campestris*, var. *sordida*. *O. Roaldi* has less pubescent stipules than in *O. coronaminis*, appressed pubescence of leaves and scapes, 5–10-flowered spikes, calyx with tube about 5 mm. long and with short triangular teeth, corolla 12–15 mm. long, and vexillum less than 1 cm. broad. From *Oxytropis Belli*, *O. coronaminis* is at once separated by its non-verticillate leaflets, more pubescent stipules with yellowish pubescence, fewer flowers, longer calyx-teeth, and much broader vexillum; from *O. arctica* by its much larger flowers, longer calyx-tube and -teeth and very large corolla with vexillum fully twice as broad as in true *O. arctica*. In its long calyx-teeth *O. coronaminis* strongly suggests the Arctic European *O. sordida* (Willd.) Pers. or *O. campestris*, var. *sordida* Koch, but it is at once separated by its deep purple corolla and especially by its very large vexillum.

12; Fox Island, Gordon Bay, *Soper*, nos. 716, 717 (Can. nos. 119,022, 119,023); Cape Dorset, *Ralph Robinson*, no. 59; *Burwash* (Can. no. 119,033), *Soper*, nos. 744, 678 (Can. nos. 119,021, 119,024). Melville Peninsula: south shore of Fury and Hecla Strait, *Parry*. King William Island: Gjöa Harbour, *Godfred Hansen* (Can). Melville Island: 1820, *Edwards*. Victoria Island: Minto Inlet, *Anderson*. Mackenzie District: Kent Peninsula, *W. H. B. Hoare* (Can. no. 119,027); Epworth Harbour, south coast of Coronation Gulf, *Cox & O'Neill*, nos. 393[a], 398 (Can. nos. 98,421, 98,422); Bernard Harbour, *R. M. Anderson* (Can. no. 114,021), *Frits Johansen*, no. 294 (Can. no. 98,423).

Ostenfeld, l. c., has pointed out the characters which separate *Oxytropis arctobia* from the plant of western Arctic America and the Bering Straits region of Siberia which passes as *O. nigrescens* (Pall.) Fischer. In the latter the free tips of the stipules are narrower, the pubescence of the leaves less silky and more scattered and the teeth of the calyx about as long as the tube. This plant, however, which occurs from Chuckches Land, Siberia eastward to Herschel Island at the mouth of the Yukon, is not very satisfactorily placed with *O. nigrescens*. The latter was based upon *Astragalus nigrescens* Pallas, Sp. Astrag. 65, t. liii. (1800), a loosely cespitose plant, collected by Merk in the region between the Aldan River and Okhotsk Sea. Pallas's beautiful plate shows conspicuously attenuate narrowly lanceolate and black-hairy stipule-tips and his description repeatedly emphasizes these characters: "stipulis calycibusque nigro-villosis;" "stipulisque petiolorum nigro-villosis hirtae" and "Folia . . . rhachi utrinque *stipula* acuminata seu semisagittata." The plant of Arctic Yukon, Arctic Alaska and extreme northeastern Chuckches Land, however, is densely cespitose, almost pulvinate, and its stipules have short deltoid and obtuse free tips which are at first white-villous or white-ciliate but soon become quite glabrate. It is the species described by Pallas immediately following *Astragalus nigrescens*, Pallas's *A. pygmaeus*, which Merk got "in terris arcticis Siberiae ad orientem ultimae, Tschucktschis habitatae," probably 2300 km. northeast and 10° north of the area in which *A. nigrescens* was found. Pallas gave a fine plate of *A. pygmaeus* and this is surely the plant of Bering Straits and arctic Alaska which is passing in America as *Oxytropis nigrescens*. It should be called *O. pygmaea*.[1]

[1] Oxytropis **pygmaea** (Pall.), n. comb. *Astragalus pygmaeus* Pallas, Sp. Astrag. 66, t. liv. (1800).—Illustrated as *O. nigrescens* by Ostenfeld, Vasc. Pl. Coll. Arct. N. Am. Gjöa Exped. t. ii, fig. 13 (1910) and Macoun & Holm, Rep. Can. Arct. Exped. V. pt. A. t. ix. figs. 1–3 (1921).

10. O. PODOCARPA Gray. Densely cespitose or pulvinate, strigose-silky with white hairs: stipules chartaceous; the deltoid-ovate free tips white-hispid and long-ciliate, finally glabrate: leaves 1–2.5 cm. long; the delicate petiole and rachis subsericeous; leaflets 2–5 pairs, linear to linear-lanceolate, subfalcate, often involute, 2–5 mm. long, loosely appressed-pubescent: scapes only slightly exceeding the leaves, very slender, 1–2-flowered: bracts oblong, glabrous on the surfaces, black-ciliate: calyx tubular-campanulate, membranaceous, black-hairy or with white hairs intermixed; the tube in anthesis 6–7 mm. long; the triangular-lanceolate teeth 2–4 mm. long: corolla violet; the obovate emarginate vexillum 1.5 cm. long, 6–8 mm. broad: legume distinctly stipitate within the calyx, membranaceous, inflated, ovoid; the body 1–2 cm. long, 7–12 mm. in diameter, minutely white-hairy: seeds reddish or brown, obliquely cordate-ovate, rounded, 2.2–2.5 mm. broad.—Proc. Am. Acad. vi. 234 (1864); Bunge, Mém. Acad. Imp. Sci. St. Pétersb. Ser. 7, xxii. no. 1: 117 (1874); Gray, Proc. Am. Acad. xx. 3 (1884), excluding *O. Hallii;* Macoun, Cat. Can. Pl. i. 115 (1883), 509 (1886); Britton in Britt. & Br Ill. Fl. ed. 2, ii. 389, in part, excluding fig. 2562 (1913). *O. arctica, δ. inflata* Hook. Fl. Bor.-Am. i. 146 (1834). *Astragalus biflorus* Schweinitz ex Gray, Proc. Am. Acad. vi. 234 (1864). *Spiesia podocarpa* (Gray) Kuntze, Rev. Gen. 207 (1891). *S. inflata* (Hook.) Britton, Mem. Torr. Bot. Cl. v. 201 (1894) and in Britt. & Br. Ill. Fl. ii. 307, in part, excluding fig. 2156 (1897). *Aragallus inflatus* (Hook.) A. Nels. Erythea, vii. 59 (1899). *A. podocarpus* (Gray) A. Nels. in Coult. & Nels. Man. Bot. Rocky Mts. 294 (1909), at least as to name-bringing synonym.—A rare species, not often collected, southern Baffin Island and northern Labrador; Yukon and Alaska to southern Alberta. The following specimens have been examined. BAFFIN ISLAND: Amadjuok Bay, *Soper* (Nat. Herb. Can., no. 119,020). LABRADOR: without statement of locality, ex herb. *Schweinitz* (TYPE of species, in Gray Herb.); Ramah, *Stecker*, no. 153; Hebron to Nachvak, *Delabarre*, no. 49 YUKON: longitude 141° W., lat. 67° N., *Cairnes* (Can, Geol. Surv. Can. no. 83,048). ALBERTA: "highest summits of the Rocky Mts.," *Drummond* (co-type of *O. arctica, δ. inflata* Hook.); high Rocky Mountains, *Burke;* Brazeau, south of Brazeau Lake, *S. Brown*, no. 1067; Mt. Paget, *J. Macoun*, no. 65,066; Pipestone Pass, *J. Macoun*, no. 65,067. BRITISH COLUMBIA: summit of McCallum Mt., South Atlin, *Guilliam* (Can., Geol. Surv. Can. no. 101,938). ALASKA: vicinity of Karluk, Kadiak Island, *Rutter*, no. 181; Chiachi Island, June 28, 1874, *Dall;* rocks, Popoff Island, Shumagin Islands, June 19, 1872, *Harrington.*

Gray's original material was a mixture. The first material discussed was the Labrador plant: "The specimens before me are from Labrador, good flowering specimens in the herbarium of Schweinitz," which are quite like *O. artica, δ. inflata* Hook. and were the unpub-

lished *Astragalus biflorus* Schweinitz. Besides the Labrador plant, which is the type, Gray cited, as supplementary, material "from Arctic America . . . ticketed '*O. campestris*' by Sir William Hooker (which may perhaps be his *O. campestris*, var. *melanocephala*), and one from Richardson named by him *O. arctica;* from the Rocky Mountains, Sir William Hooker's *O. arctica* δ, of Drummond's collection; . . . ; and finally, a fruiting specimen of the latter from Bourgeau's collection." The Arctic American plants referred to by Gray I have not seen, but they are very likely not identical with the others. The Drummond material of *O. arctica,* δ. *inflata* Hook. is, as stated, identical with the Labrador plant, but the Bourgeau plant is *O. Hallii* Bunge, a much coarser species with longer lanceolate free stipule-tips, longer leaves with more numerous and coarser leaflets, and capsules firmer, less stipitate and larger than in *O. podocarpa.* The Colorado plant commonly referred to the latter species is *O. Hallii* and some other Alberta specimens besides those of Bourgeau belong to it.

Explanation of Plates 171 to 175

(Photographs by *J. F. Collins*)

171, Oxytropis gaspensis × ⅜, type specimen, *Fernald & Smith,* no. 25,874. 172 (lower), O. hudsonica × 1, duplicate type, *Low,* no. 14,272; (upper), O. arctica × 1, duplicate type from Melville Island, *Parry's* Voyage, 1820. 173, O. johannensis × ⅜, type specimen, *Fernald,* no. 2289. 174, O. terrae-novae × 1, *Wiegand, Gilbert & Hotchkiss,* no. 28,607. 175, O. coronaminis × 1, type specimen, Arctic sea-coast (Coronation Gulf), *Richardson.*

(*To be continued*)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXXII.

(*Continued from page 155.*)

II. THE NORTH AMERICAN SPECIES OF ANEMONE § ANEMONANTHEA

M. L. FERNALD

IN North America the species of *Anemone* § *Anemonanthea* DC. were for many years treated as identical with the Eurasian *A. nemorosa* L. or at most as an American variety, *A. nemorosa,* var. *quinquefolia* (L.) Pursh. Gradually, however, it has been recognized that we have no true *A. nemorosa* native in America, that *A. quinquefolia* L. is an endemic American species and that the members of the section on the Pacific slope are not identical with those of the Atlantic slope. All the species known in America have been properly described, but their characters have not been well worked out, and in such a current work as Piper's *Flora of the State of Washington* (1906) *A. Piperi* Britton, a plant with coarse ascending and usually forking rootstock, usually tufted flowering stems accompanied by one or more basal leaves and broad and short-beaked achenes, is reduced without comment to the eastern *A. quinquefolia,* which has slender horizontal and simple rootstock, solitary flowering stem usually without basal leaf and fusiform long-beaked achenes. Or in a later work, Jepson's *Manual of the Flowering Plants of California, A. quinquefolia* is made to include (as a variety) the endemic Californian *A. Grayi* Behr & Kell., a very distinct plant, differing from *A. quinquefolia* in having a thick and nodulose rootstock, with strong constrictions (in *A. quinquefolia* slender, cylindric and not nodulose), leaflets crenate and strongly pilose (in *A. quinquefolia* sharply toothed and essentially glabrous), sepals white or blue, rarely more than 1 cm. long, with the branches of the veins evanescent toward the tip (in *A. quinquefolia* the sepals white or pink, mostly 1–2.5 cm. long, with the branches of the veins extending to the margin) and achenes much smaller than in *A. quinquefolia,* with a beak about 0.5 mm. long (in *A. quinquefolia* 1–2 mm. long).

In eastern America, likewise, the group has not been satisfactorily understood. The late C. V. Piper had collected in the Virginia mountains a beautiful little plant of the section *Anemonanthea* which certainly finds no place in the two eastern species commonly recog-

nized; and the plant of the Alleghenies which was described by Pursh as *A. lancifolia*, but which all recent authors have identified with the continental European *A. trifolia* L., shows, when the series is laid beside a good display of the European plant, striking departures which seem not to have been recorded.

It seemed desirable, therefore, that our members of *Anemone* § *Anemonanthea* should be studied anew; and in the spring of 1921, having a keen student in Miss Helen Benedict (now Mrs. Frederick I. Daniels), I suggested that she attempt this study. The result was most gratifying but, unfortunately for the complete solution of the problem, the work did not reach finality, and Miss Benedict's change of plans made it out of the question for her to renew the study. She had, however, worked out many constant and hitherto undetected specific characters and prepared a clear key, and her work had definitely brought out the fact, long suspected, that the Alleghenian *A. lancifolia* is well distinguished from the European *A. trifolia.* She, furthermore, was able to identify the little plant found by Piper in the Virginia mountains with *A. minima* DC. (1817), a species apparently "lost" for almost a full century. Since Mrs. Daniels's results contain so much that is new and helpful, I have felt it important to bring them out. The main outline of the treatment is hers and only because of her modesty about presenting the results do I assume their authorship.[1] In this study Mrs. Daniels (and I) had the great advantage of examining the full series of western species in the herbarium of the State College of Washington, kindly loaned by Professor Harold St. John, a series of *A. lancifolia* generously loaned by Mr. E. B. Bartram and the material of this species in the herbarium of the Academy of Natural Sciences of Philadelphia sent by Mr. Long. These collections supplemented those of the Gray Herbarium.

[1] The great Linnaeus once issued a series of theses by his students under the title *Amoenitates Academicae* and Presl published the results of the great collecting expeditions of Haenke as *Reliquiae Haenkeanae.* In the pigeon-holes in my laboratory I find the partially completed revisions left by many temporary investigators. I have completed and published some of these studies and hope from time to time to bring others to conclusion and publication. It has been suggested that I call the series, in weak imitation of Linnaeus, "*Amoenitates Academicae*"; but, in addition to the undesirable duplication of title, it must be admitted that not all such "housecleaning" work is an amenity. It would, therefore, be more appropriate, if it should ever be desirable to reprint these papers as a separate work, to borrow a cue from Presl and call the series *Reliquiae Academicae*!

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KEY TO AMERICAN SPECIES OF ANEMONE § ANEMONANTHEA

a. Leaves of involucre petioled, each 3–5-foliolate: rootstock thickened: achenes fusiform, ellipsoid or ovoid, at most 2 mm. thick....*b.*

b. Veins and veinlets of the sepals strongly anastomosing below the usually free tips[1]....*c.*

c. Rootstock subligneous, continuous, without scaly teeth: leaflets of involucral leaves deeply incised or cleft; the lateral ones often cleft nearly or quite to base: sepals commonly 6 (5–9): filaments elongating to 2 or 3 times the length of the carpels.....1. *A. nemorosa.*

c. Rootstock fleshy, scaly-toothed: leaflets of involucral leaves not at all or only rarely and but slightly incised; lateral ones simple, merely serrate-dentate: sepals commonly 5 (4–7): filaments shorter than to less than twice as long as the carpels.....2. *A. lancifolia.*

b. Veins and veinlets of the sepals free or only very slightly anastomosing....*d.*

d. Flowering stems solitary from a simple horizontal rootstock....*e.*

e. Stamens in 2 or more series, mostly 30 or more: sepals (except in poorly developed individuals) 0.6–2.5 cm. long, 3–11 mm. wide: rootstock elongate, 1–7 mm. thick....*f.*

f. Rootstock slenderly cylindrical, 1–5 mm. thick: leaves glabrous to more or less pubescent....*g.*

g. Middle leaflet of involucral leaves (except in weak individuals) commonly with 2–7 sharp teeth on each margin; lateral leaflets commonly cleft nearly or quite to base, with 4–12 teeth or segments on the outer margin: sepals white or roseate: filaments whitish, rarely twice as long as the carpels: beak of mature achene falcate 4. *A. quinquefolia.*

g. Middle leaflet of involucral leaves entire or with 1–4 blunt teeth on each margin; lateral leaflets entire or but slightly cleft, with at most 7 blunt marginal teeth: sepals blue: filaments blue or bluish, becoming 2 or 3 times as long as the carpels: beak of mature achene straight.....5. *A. oregana.*

f. Rootstock nodulose, with strong constrictions, 2–7 mm. thick: leaflets blunt, scarcely cleft, with numerous crenate teeth and strongly pilose surfaces.....6. *A. Grayi.*

e. Stamens in a single series, 10–20 (rarely –30): sepals 0.35–1.6 cm. long, 1.7–6 mm. wide: rootstock short, slender, 1–4 mm. thick.....7. *A. Lyallii.*

d. Flowering stems 1–several from the usually forking summits of an erect or ascending rootstock.....8. *A. Piperi*

a. Leaves of involucre sessile or subsessile, simple: rootstock filiform or flagelliform: achenes compressed-pyriform, 3–4 mm. broad.....9. *A. deltoidea.*

[1] In the absence of flowering material of (3) *A. minima* it is quite impossible to say whether the veins of the sepals are anastomosing or free, and, consequently, to assign it a proper place in the key. *A. minima* is a very rare plant of the Virginia mountains, with almost filiform stems; closely pubescent foliage, the hairs of the upper leaf-surfaces pustulate at base; leaflets very small and sharply dentate-serrate; sepals described as about 8 mm. long and 4 mm. wide; and softly villous or almost lanuginous small achenes.

1. A. NEMOROSA L. Sp. Pl. i. 541 (1753); for fuller synonymy see Gürke in Richter, Pl. Eu. ii. 473 (1897).—A Eurasian plant, sometimes cultivated in America; rarely spreading or persisting after cultivation. The only American specimens seen are from MASSACHUSETTS: persistent and spreading about old S. P. Fowler garden, Danvers, May 20, 1903 and May 6, 1904, *J. H. Sears* (station now reported to be destroyed).

2. A. LANCIFOLIA Pursh. Rootstock stoutish, 2–5 mm. thick, crisp, whitish when fresh, horizontal, covered with tooth-like scales: flowering stems solitary, glabrous or nearly so, stoutish, 1.4-3.5 dm. high: radical leaves solitary, long-petioled, with 3 sessile leaflets; the 2 lateral deeply cleft: involucre toward the summit of the stem, with 3 short-petioled leaves; the 3 rhombic to narrowly ovate leaflets dentate, 2–8.7 cm. long, the lateral often deeply cleft: sepals commonly 5 (4–7), whitish, 1.3–2 cm. long, their veins numerous, freely forking, subparallel, strongly anastomosing: stamens very numerous; the filaments shorter than to less than twice the length of the carpels: achenes minutely hirsute, fusiform, 3.5–3.8 mm. long, tipped by a straight or slightly curved obliquely thick-subulate beak 1–1.5 mm. long.—Fl. Am. Sept. 386 (1814). *A. nemorosa* Torr. & Gr. Fl. N. A. i. 12 (1838), in part, not L. (1753). *A. nemorosa* or *A. trifolia* Gray, Am. Nat. vii. 422 (1873), not L. (1753). *A. trifolia* Britton, Ann. N. Y. Acad. Sci. vi. 226 (1891); Robinson in Gray, Synop. Fl. i. pt. 1: 13 (1895); Small, Fl. Se U. S. 436 (1903); Ulbrich, Engler's Bot. Jahrb. xxxvii. 219 (1905); not L. (1753). *A. cuneifolia* Schweinitz acc. to Britton, Ann. N. Y. Acad. Sci. vi. 226 (1891), not Juss. (1804). —Damp woods and thickets of the Alleghenies, southern Pennsylvania to Georgia. Fl. April–early June.

It has required more than a full century for *Anemone lancifolia* to establish its identity as a species. As indicated in the bibliography, Torrey & Gray placed it unequivocally in the European *A. nemorosa* and in 1873, when he received material from Virginia, Asa Gray reaffirmed his conviction that it is *A. nemorosa* but suggested also that it might be *A. trifolia*, saying:

"*Anemone nemorosa*, or *trifolia*. From the Peaks of Otter, at altitude of about three thousand feet, Mr. A. H. Curtiss sends an anemone of a form new to this country (although there is some approach to it in Oregon), which may be called *A. nemorosa* with undivided leaflets or *A. trifolia* L., according to the botanists' fancy. It is fully as large as the latter, having the stem a foot high up to the leaves, and the leaflets two and one-half inches long; the deepness of the teeth of these, and a slight tendency to trilobation, should rather refer it to *A. nemorosa*, which not rarely exhibits this state in Europe. This European form, as Mr. Curtiss remarks, appears to have kept company with *Convallaria majalis*,[1] being here associated with it in one of the most

[1] The idea that the native plant of the Alleghenies is identical with *Convallaria majalis* of Europe is as strongly entrenched as has been the conviction that the Alleghenian *Anemone lancifolia* is either *A. nemorosa* or *A. trifolia* of Europe. In the spring of 1921, while Mrs. Daniels was studying *Anemone*, Miss Marion E. Allen

northern stations of this plant, which in America is restricted to the Alleghenies." [1]

In 1891 Britton, without stating his reasons, identified *A. lancifolia* with *A. trifolia* of continental Europe; in 1895 Robinson, calling it *A. trifolia*, said: "The American plant does not differ by any constant or satisfactory character from the European, which is regarded as a good species"; [2] and in 1905 Ulbrich affirmed the *complete identity* of the two, saying "Im atlantischen Nordamerika findet sich *A. trifolia* L. in Formen, die mit den europäischen völlig identisch! sind." [3] In the light of such positive and authoritative assertions of the identity of the Alleghenian and the European plants it might seem that further comparisons of the two would be futile. Nevertheless, the species of the Alleghenian flora are, in general, so thoroughly distinct from those of southern Europe that it would be a remarkable exception if *A. trifolia* of the region from Portugal to the Apennines and the Carpathians were to reappear in the mountains from southern Pennsylvania to Georgia. It is therefore, reassuring that, in making comparison of all characters of the two, Mrs. Daniels should have found that the European plant differs from the American in frequently having 2 flowers (in the American only 1), the stamens fewer and with filaments more than twice the length of the carpels (in the American the more numerous stamens with filaments shorter than to less than twice the length of the carpels), the sepals commonly 6 or 7 (in the American commonly 5), with the few veins faint, their branches running free to the tip (in the American the numerous veins more obvious,

undertook a similar study of *Convallaria majalis*. Her study was, likewise, interrupted, chiefly through need of further material, but it became evident that the plant of the southern Alleghenies is not identical with that of Europe but that in habit it more nearly resembles the plant of eastern Asia (Japan and Manschuria). In the European plant the scape is elongate, so that the flowers are borne opposite the middles or the upper halves of the leaves. In the native plant of the Alleghenies the scape is shorter, the raceme well overtopped by the leaves. In this character the eastern Asiatic and the indigenous Alleghenian plants are similar but, judging from a small representation, the Asiatic has the leaves shorter and broader than in the American and the European. The scanty material at hand shows the anthers of the European and the Alleghenian plants much longer than in the Asiatic and overtopping the ovary; the shorter anthers of the eastern Asiatic plant barely equaling or scarcely reaching the summit of the ovary. In scanty fruit of the Alleghenian and the Japanese plants the seeds are different from each other and from the European: in *C. majalis* of Europe nearly round in outline; in the Alleghenian oblate, distinctly broader than high; in the Japanese obliquely obovoid, higher than broad. Should these characters be found constant when a fuller series can be compared, the eastern Asiatic plant would be called, apparently, C. KEISKEI Miquel, Ann. Mus. Bot. Lugd. Bat. iii. 148 (1867); the Alleghenian plant C. MAJUSCULA Greene in Fedde, Rep. Nov. Spec. v. 46 (1908).

[1] Gray, Am. Nat. vii. 422 (1873).

[2] Robinson, in Gray, Synop. Fl. i. pt. 1. 13 (1895).

[3] Ulbrich, Engler's Bot. Jahrb. xxxvii. 219 (1905).

their branches strongly anastomosing). These characters, reinforced by those of the foliage, are certainly significant: in *A. trifolia* the middle leaflet of the involucral leaf is commonly lanceolate, broadest below the middle, ranging from one-third to one-half as broad as long, long-acuminate and with 5–17 (av. 10) sharp teeth on each margin. In *A. lancifolia* (unfortunately named) the middle leaflet is more oblong to rhombic, broadest at or slightly above the middle, one-third to three-fourths as broad as long, blunter and less acuminate and with 3–13 (av. 7) mostly appressed or rounded teeth. That the two plants are not identical should be apparent and in view of the probability that Pursh, whose type-specimen is presumably lost, had the Alleghenian plant it is here taken up as *A. lancifolia.*

3. A. MINIMA DC. Rootstock short, slender, horizontal, white and brittle: basal leaves with filiform petiole, rhombic-ovate leaflets 2–3 cm. long, sharply dentate above, entire and cuneate below, pilose upon both surfaces: flowering stem filiform, glabrous, or pilose above, 1–1.5 dm. high: involucral leaves 3, slender-petioled; leaflets 1–2 cm. long, pilose on both surfaces, rhombic, sharply dentate-serrate above the middle: sepals 5, white, oblong, about 8 mm. long and 4 mm. wide: achenes few, ellipsoid, 2.5–3 mm. long, softly villous or almost lanuginous; the recurving beak about 1 mm. long.—Syst. i. 206 (1817).—VIRGINIA: "Hab. in Virginia ad montes Alleghanis. *Palisot de Beauvois*"—DC. l. c.; Craig's Creek, May 21, 1916, *C. V. Piper.*

A very neat little species, apparently highly localized, as indicated by the fact that it remained unrecognized for practically a century after its description by DeCandolle.

4. A. QUINQUEFOLIA L. Rootstock horizontal, comparatively slender, 1–4 mm. thick, crisp, whitish when fresh, covered with tooth-like scales: radical leaves solitary, long-petioled, with 3 or by division of the lateral leaflets seemingly 5 rhombic leaflets: flowering stem solitary, glabrous or sparsely hairy, slender, 0.5–3 dm. high, bearing 3 (rarely 2 or 4) long-petioled glabrous or nearly glabrous involucral leaves toward the summit; the 3–5 cuneate-obovate to rhombic or lanceolate leaflets acuminate, incised, 1–5 cm. long; the lateral often deeply cleft: sepals commonly 5 (4–9), whitish, ordinarily tinged outside with pink to crimson, or colored throughout, oblong to oval, 0.6–2.5 cm. long; veins simple or subsimple, nearly parallel, slightly forking above the middle, the branches free to the tip or very rarely slightly anastomosing: stamens numerous, in several series; the longer whitish filaments rarely twice as long as the carpels: anthers 0.5–0.8 mm. long: achenes densely short-hirsute, fusiform, 3.5–4.5 mm. long, tipped by a curved subulate beak 1–2 mm. long.—Sp. Pl. 541 (1753); Bart. Fl. N. A. ii. 10, t. 39, fig. 2 (1822); Britton, Ann.

N. Y. Acad. Sci. vi. 225 (1891); Robinson in Gray, Syn. Fl. N. A. i. 13, as to eastern plant (1895); Mathews, Field Bk. Am. Wild Fl. 134 (1902); House, Wild. Fl. N. Y. i. 106, t. 68A (1918). *A. nemorosa* of eastern Am. auth., not L.; Meehan, Nat. Fl. and Ferns, i. 21, t. 6 (1878). *A. pedata* Raf. Med. Rep. Hex. 2, v. 361 (1808) *A. nemorosa*, β. *quinquefolia* (L.) Pursh, Fl. Am. Sept. ii. 283 (1814); DC. Syst. Nat. i. 204 (1817). *A. nemorosa*, forma *quinquefolia* (L.) Britton, Bull. Torr. Bot. Cl. xvii. 123 (1890). *A. nemorosa*, subsp. *americana*,[1] var. γ *quinquefolia* (L.) Ulbrich, Engler's Bot. Jahrb. xxxvii. 226 (1905). *Anemonanthea quinquefolia* (L.) Nieuwl.[2] Am. Midl. Nat. iii. 174 (1914). *Nemorosa quinquefolia* (L.) Nieuwl. l. c. 322 (1914).—Open woods, damp thickets and clearings, Gaspé County, Quebec[3] to southern Manitoba, south to Georgia, Tennessee and Iowa. Fl. April–June.

5. A. OREGANA Gray. Rootstock slender, 1.5–4 mm. thick, horizontal, whitish, simple: basal leaves rarely present on the flowering plant: flowering stem solitary, very slender, glabrous or nearly so: involucral leaves very thin; the middle leaflet oblanceolate to narrowly rhombic-obovate, subcuneate and entire below the middle, entire or with 1–4 coarse blunt teeth or rarely incised above, 2–8 cm. long; lateral leaflets obliquely lanceolate to narrowly ovate, subentire to incised: sepals blue-purple, 1–2 cm. long; their veins mostly forking, with the branches free to the tip: stamens numerous; the longer twice or thrice the length of the carpels; the filaments pink or bluish: achenes lance-fusiform, hirsute, 4–5 mm. long, with a straight oblique thick-subulate beak 1–1.5 mm. long.—Proc. Am. Acad. xxii. 308 (1897); Piper, Contrib. U. S. Nat. Herb. xi. 267 (1906); Piper & Beattie, Fl. N. W. Coast, 154 (1915). *A. cyanea* Freyn. Deutsche Bot. Monatzchr. viii. 176 (1890), not Risso (1844). *A. Grayi* Britton, Ann. N. Y. Acad. Sci. vi. 226 (1891), in part, not Behr. & Kell. (1884). *A. quinquefolia*, var. *oregana* (Gray) Robinson in Gray, Syn. Fl. i. 131 (1895). *A. nemorosa*, subsp. *americana*, var. *oregana* (Gray) Ulbrich, Engler's Bot. Jahrb. xxxvii. 227 (1905).—Woods and damp thickets, Washington and Oregon, locally eastward to northeastern Idaho. Fl. April–August.

6. A. GRAYI Behr & Kell. Rootstock nodose, 2–7 mm. thick, horizontal, whitish when fresh: flowering stem solitary, glabrous or

[1] Ulbrich, with Germanic disregard of exact bibliography, cites "Subsp. 3 **americana** L. Spec. plant, ed. 1 (1753) p. 541 p. sp."; but Linnaeus published no *A. americana*, the only American species on p. 541 being *A. quinquefolia*.

[2] Nieuwland gives as the basis for this combination: "*Anemonenthea quinquefolia* Linn. l. c. Sp. Pl. p. 541"; but Linnaeus had no genus *Anemonanthea*.

[3] The only basis for *A. quinquefolia* in Gaspé County, Quebec is a specimen brought back, with other characteristic plants of Grand River, by the late George H. Richards in 1903, and recorded by me at that time in a manuscript note-book. Slightly later, not then appreciating the interest of the station, I made a manuscript record of seeing the plant at Bic, Rimouski County. In view of the rarity of the plant north of the St. John valley in Maine and New Brunswick, material to serve as vouchers for its occurrence in eastern Quebec is much needed.

sparsely hairy, slender, 1–4 dm. high: radical leaves solitary, long-petioled, with 3 blunt leaflets; the lateral leaflets deeply cleft and, on the outer border, crenate nearly to base: involucre toward the summit of the stem, with 3 (rarely 2) slender-petioled leaves; the narrowly rhombic blunt leaflets crenate, strongly pilose on both surfaces, 1–3.5 cm. long; lateral leaflets scarcely cleft: sepals commonly 5 or 6, white or blue, oval, 0.7–1.3 cm. long, with the branches of the freely forking veins evanescent: stamens numerous; the longer filaments fully twice as long as the carpels: achenes densely short-hirsute except at the glabrous tip, fusiform-ellipsoid (the young 1.5 mm. long), tipped by a curved style (the young 0.6 mm. long).—Bull. Cal. Acad. i. 5 (1884); Greene, Bot. San Franc. Bay Reg. 2 (1894). *A. nemorosa*, subsp. *americana*, var. *oregana* Ulbrich, Engler's Bot. Jahrb. xxxvii. 227 (1905), in part, not *A. oregana* Gray (1887). *A. quinquefolia*, var. *Grayi* (Behr & Kell.) Jepson, Fl. W. Mid. Cal. 168 (1911).—Woods and thickets on the mountains of western California. Fl. March–June.

7. A. Lyallii Britton. Dwarf: rootstock horizontal, only 0.6–1.6 cm. long, 1–4 mm. thick, whitish when fresh: flowering stem solitary, glabrous or nearly so, filiform, 0.5–2.8 dm. high: radical leaves rarely on the flowering plant, long-petioled, with 3 leaflets: involucre with 3 slender-petioled leaves, the 3 narrowly obovate to elliptic-ovate leaflets crenate or incised, especially near the tip, 1–3 cm. long; the lateral leaflets scarcely cleft: sepals commonly 5, white or blue, 0.35–1.6 cm. long, 1.7–6 mm. wide, with few simply forking veins running free to the margin: stamens in a single series, 10–20 (–30); the filaments exceeding the carpels: achenes ellipsoid, plump, 4 mm. long, finely appressed-pubescent up to the base of the very short subulate beak.—Ann. N. Y. Acad. Sci. vi. 227 (1891); Piper, Contrib. U. S. Nat. Herb. xi. 267 (1906); Piper & Beattie, Fl. N. W. Coast, 153 (1915). *A. quinquefolia*, var. *Lyallii* (Britton) Robinson in Gray, Syn. Fl. N. A. i. 13 (1895). *A nemorosa*, subsp. *americana*, var. *Lyallii* (Britton) Ulbrich, Engler's Bot. Jahrb. xxxvii. 227 (1905).—Damp woods near the coast, Vancouver Island to Siskiyou County, California, locally eastward into the Cascade Mts. Fl. April–July.

8. A. Piperi Britton. Rootstock coarse, blackish (at least when dry), only slightly scaly, often forking, commonly oblique or ascending: basal leaf commonly present at flowering time: flowering stems stiffish, 1–6 from a rootstock, 1–3.5 dm. high: leaflets of the involucre 1.5–6 cm. long, usually appressed-pubescent at least when young; the middle one rhombic-obovate to -ovate, cuneate and entire below the middle, coarsely toothed and cleft above; the lateral leaflets obliquely ovate, with the rounded outer margin toothed nearly to base: sepals elliptic-ovate to oblong, white, 0.6–2 cm. long, with the branches of the mostly forking veins free to the tip: stamens very numerous; the filaments much exceeding the carpels: achenes obliquely ovoid, hirsute to the tip 3–4, mm. long, with a straight or

barely curved beak 0.5–1 mm. long.—Britton in Rydberg, Bull. Torr. Bot. Cl. xxix. 153 (1902). *A. quinquefolia* of western Am. botanists, not L.—Woods and damp thickets, northwestern Idaho to the Cascade Mts. of Washington and the Wallowa Mts. of Oregon. Fl. April–July.

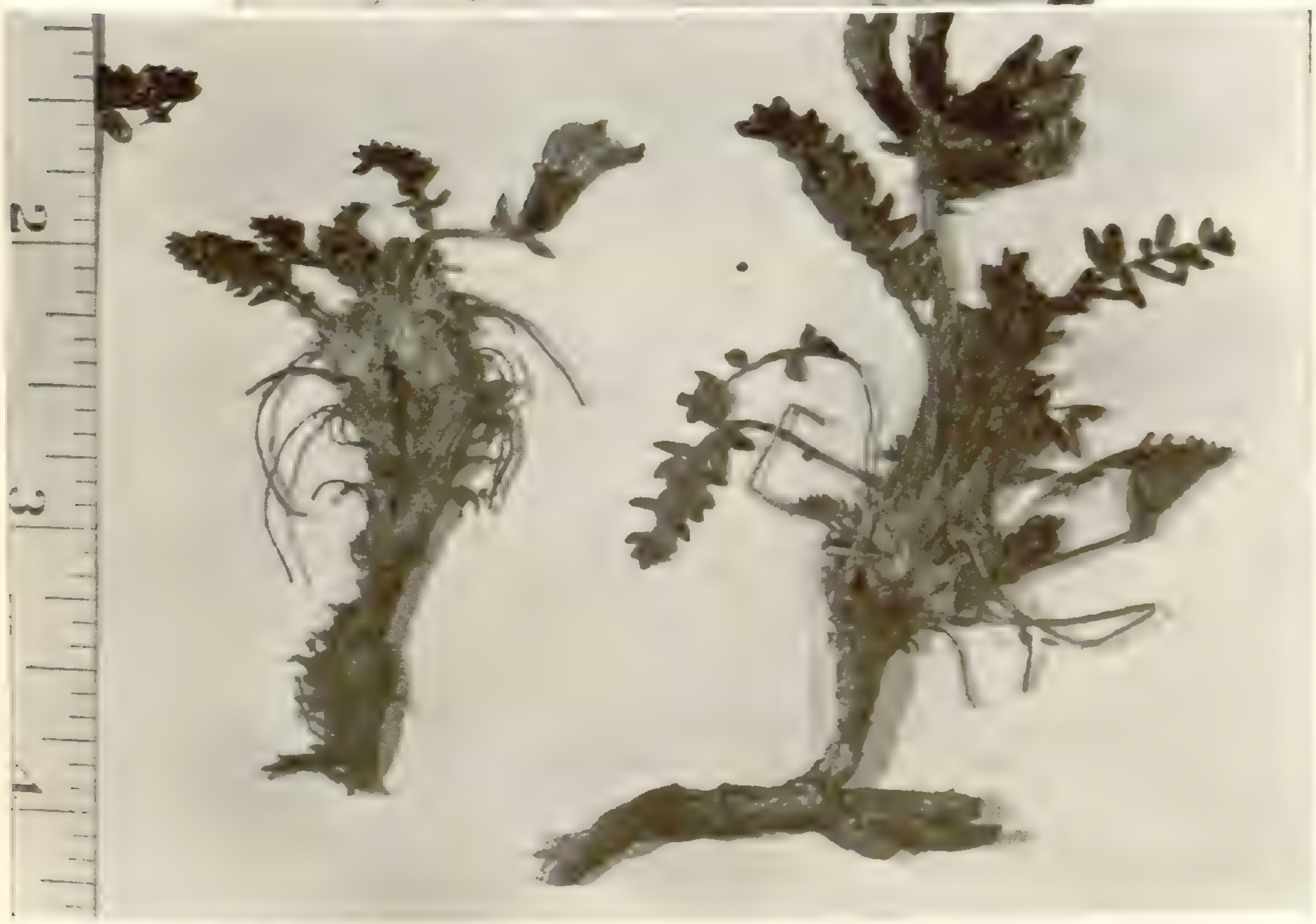
Anemone Piperi is generally passing in the Northwest as *A. quinquefolia*. It is, however, at once distinguished by its heavier and more ascending dark rootstock which is commonly forking at summit; by the strong tendency to produce two or more flowering stems; by the very frequent basal leaves at the bases of the flowering stems; by the thicker and broader, usually less cleft leaflets and by the broader achenes with much shorter beak. In its dark rootstock and its achenes *A. Piperi* suggests the Eurasian *A. nemorosa*, but that species has a simple horizontal rootstock without scales, the flowering stem solitary, the leaflets of the involucre dissected and the veins of the sepals very freely anastomosing.

The original number of *Anemone Piperi*, Piper, no. 1469, from Latah County, Idaho, seems to consist of two species. None of the specimens seen show rootstocks but the material of this number in the Gray Herbarium shows young fruit and is the plant so characteristic of northwestern Idaho above described. Sandberg, MacDougal & Heller's no. 194, also cited by Britton in the original description, is the plant above described; but Piper's material preserved at the State College of Washington has the very thin leaves and longer and more fusiform achenes of *A. oregana*.

9. A. DELTOIDEA Hook. Fl. Bor.-Am. i. 6 (1829); Torr. & Gray, Fl. N. A. i. 13 (1838); Britton,[1] Ann. N. Y. Acad. Sci. vi. 225 (1891); Robinson in Gray, Syn. Fl. N. A. i. 12 (1895); Ulbrich, Engler's Bot. Jahrb. xxxvii. 218 (1905).—Woods of the coast region, Washington to California.

[1] Britton and, following him, Ulbrich ascribes the species *A. deltoidea* to Douglas in Hook. But examination of the original description fails to reveal the ground for treating it as Douglas's species. It was clearly published by Hooker as a new species and Douglas's only connection with it was as collector of some of the original specimens.

OXYTROPIS GASPENSIS × 3/8



(Upper) Oxytropis arctica × 1
(Lower) Oxytropis hudsonica × 1

OXYTROPIS JOHANNENSIS × 3/8

OXYTROPIS TERRAE-NOVAE × 1

OXYTROPIS CORONAMINIS × 1

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXIII.

I. SCHMIDEL'S PUBLICATION OF THELYPTERIS

M. L. Fernald and C. A. Weatherby

(Plate 179.)

Since various Old World and some American botanists have objected to the taking up of *Thelypteris* Schmidel, Icon. Pl. ed. 2: 45, tt. 11 and 13 (1762) in place of *Dryopteris* Adans. Fam. Pl. ii. 20, 551 (1763), as interpreted by Kuntze, Underwood and Christensen, we ought, perhaps, to explain the reasons for holding to *Thelypteris*. And since there is impending a botanical congress at which nomenclatural questions may be discussed and decided, we permit ourselves the hope that a restatement of the case may lead to some definite and desirable result.

Woynar (Hedwigia, lvi. 385, footnote (1916)), followed by Schinz and Thellung (Vierteljahrsschr. der Naturforsch. Gesellsch. Zürich, lxvi. 257 (1921)), has argued that Schmidel was not proposing a new genus, but merely applying the name *Thelypteris* Ruppius; that the "primary element" of Ruppius's genus was *Pteris aquilina* L.; that this species must, therefore, be regarded as the type of *Thelypteris* Schmidel, which thus becomes a mere synonym of *Pteris* L. The argument is based on Schmidel's discussion of the proper systematic position of *Thelypteris palustris non ramosa* of Ruppius, in his preface (3rd page; the pages are not numbered), and particularly on the remark that the plant "vera existat species Thelipteridis si hujus character in seminibus sub margine reconditis ponitur" ("stands as a true species of *Thelypteris*, if its character consists in the hiding of the seeds under the margin").

Woynar may be, and in all probability is, correct as to his premises. But the purely historical method of typification by which he arrives at his conclusion is nowhere sanctioned by the International Rules and seems to be discouraged by the examples given under Art. 45. It is, moreover, essentially a violation of the rule that botanical nomenclature of the vascular plants begins with 1753 (Art. 19). Pre-Linnean literature must often be consulted to determine identities; but the *names* in it have now no legal standing, and to use them, as Woynar does, as strict name-bringing synonyms, is simply to ignore 1753 as a point of departure. It may be granted that Schmidel was not seeking to establish a new genus, but only to select from generic names already available one which could be properly applied to the plant he had in hand. But, having made his selection and applied his name, for the first time after 1753, to a single unmistakable species, with which no other is mentioned as congeneric, he thereby fixed the correct use of the name for subsequent authors; and he ought to be followed, regardless of where in pre-Linnean literature he got the name and in what sense the original author had used it.

Woynar (l. c.) further remarks, incidentally, that the priority of *Thelypteris* is very questionable ("höchst fräglich"). But he gives no evidence whatever in support of his statement, and, so far as we know, neither he nor anyone else has ever given any. It is the universal and proper custom to hold the dates on botanical title-pages innocent of deception until proved guilty; in default of proof, Schmidel's 1762 must be taken at its face value.

Nakai (Bot. Mag. Tokio, xl. 61 (1926)) argues that, though Schmidel's "figures are so good as no one can make a mistake with other than *Dryopteris Thelypteris* . . . no generic character [is] given in the description. Explicatio figurarum suffixed is the explanation of the figures which is designated by him as '*Thelypteris palustris non ramosa*.' So his *Thelypteris* could not be considered as a generic name, but simply as a vague significance of a group of plants." Mackenzie (Amer. Fern. Journ. xvii. 117 (1927)), developing this line of attack (at which he appears to have arrived independently) concludes that *Thelypteris* is a sort of Latin vernacular term, strictly equivalent to the English "marsh fern," and an example of the uninomial nomenclature expressly forbidden by the International Rules (Art. 54, par. 2).

It appears to us that these authors, in stating that Schmidel did not distinguish between genera and species and that he gave no generic description, have not given sufficient weight to Schmidel's preface. The passages concerned are too long to quote; but to anyone who will take the trouble to conquer his rather involved Latin, it should be plain that Schmidel understood very clearly the difference between species, genera, and larger groups, and that he not only used his names in a generic sense, but spent much pains in choosing such as would apply correctly to the plants he was illustrating. One is not thus particular about vernacular appellations, Latin or otherwise.

As to generic description, there is a phrase of it in the passage from the preface quoted at the end of our second paragraph. It is informal and even tentative (Schmidel was evidently not wholly sure of his ground), and it is not a correct definition of *Dryopteris* as now understood. It is, however, accurate enough for the single species with which Schmidel was dealing, in which at least the young sori are commonly covered by the reflexed margins of the pinnules; and it may be held to fulfill technical requirements.

In any case, description in words is not always essential for generic publication. Art. 38 of the International Rules, indicating methods of publishing (or rather not publishing) genera, refers back to Art. 37, where specific publication is discussed. Art. 37 consists chiefly of negatives; the one positive definition is as follows: "Plates accompanied with analyses are equivalent to a description; but this applies only to plates published before January 1, 1908." Schmidel had two plates, one showing the habit of the plant, the other (our Pl. 179) giving in exquisite detail the analyses: enlargements of pinnae to show venation, young indusia and mature sori, magnified indusia, sporangia and spores, all so good that, as Nakai says, no one can mistake the plant for anything but *Acrostichum Thelypteris* L. The fact, noted by Nakai, that the habital plate (the other has no caption whatever) is "designated .. *Thelypteris palustris non ramosa,*" appears not to be important. It is difficult to illustrate a genus without also illustrating at least one of its component species; and where, as in this case, there is only one, the line between generic and specific diagnosis becomes hard to trace.

It would appear, then, that by the statements of the International Rules, *Thelypteris* was properly published.

It will be noted, and may not be without significance, that there

is a considerable lack of unanimity among the objectors to *Thelypteris*. Woynar and Schinz and Thellung find nothing wrong with its publication; Nakai and Mackenzie find nothing wrong with its typification. Each group accepts without question what the other rejects.

It may be added that *Thelypteris* was used by Schott in his splendid redefinition of the genera of ferns (Gen. Fil. ad t. 10) in the strict sense of Schmidel for the immediate group of the marsh fern; was taken up by Miss Slosson in Rydberg, Fl. Rocky Mts. 1043 (1917) to cover *Dryopteris* subgenus *Lastrea* of Christensen; and in the larger sense, as the equivalent of *Dryopteris* of Christensen, was revived by Nieuwland (Am. Midl. Nat. i. 226 (1910)) and again by Weatherby (Rhodora, xxi. 174, 177 (1919)).

Dryopteris has been much discussed, but, for the sake of completeness of statement, it may be worth while to go over again some of the well-trodden ground. Adanson's description, as compiled from the headings of his tabular synopsis, is as follows: "Paquets de fleurs Ronds, disposés sur 2 rangs sous chaque division des feuilles. Enveloppe enparasol. Globules environnés d'un anneau élastique." Only the phrase "enveloppe enparasol" applies exclusively to *Dryopteris;*[1] it is therefore, in a strict sense, its diagnosis, *i. e.* the character by which alone *Dryopteris* is to be distinguished from other genera to which the other characters given also apply.

For the rest, we can do no better than quote Nakai. "By 'enparasol' one could be easily led to consider it as *Aspidium* [as limited by Diels] or *Polystichum;*" and Nakai goes on: "H. W. Schott used *Dryopteris* also in 1834, and A. Gray in 1856 [actually 1848]. Since then it had been long neglected till O. Kuntze applied it in 1891. Kuntze's combinations are often too much even for a generous botanist; hence *Dryopteris* would have been buried eternally in the dust of synonyms if Dr. Christensen had not picked it again and made the laborious combinations in his Index Filicum." Nakai then goes on to show that, when it came to naming specimens, Adanson had no clear conception of *Dryopteris* such as that of Christensen and that the phrase "enveloppe enparasol" was sometimes properly used by him, since in his herbarium there are included in *Dryopteris* 5 species with shield-shaped indusia, nowadays put into *Polystichum;* but more often not, since 8 other species included were *Dryopteris* of Christensen, and the remainder belonged in six other

[1] "paquets de fleurs Ronds . . ," for instance, covers also *Filix* and *Polypodium.*

genera, such as *Asplenium, Athyrium,* and *Cystopteris.* How much more definite is Schmidel's *Thelypteris*, beautifully illustrated by analyses the identity of which cannot be doubted![1]

Mackenzie (l. c. 121), arguing against the "strained" interpretation[2] of "enparasol" as peltate, maintains that by this phrase Adanson intended only to differentiate the more or less rounded indusium of this genus from the more or less elongated, valve-like indusium of other genera. This appears to us improbable. Adanson had already, in the preceding column of his tabular arrangement, made the contrast between "longs" or "ovales" and "ronds" sori; it is not likely that he would immediately repeat it for the indusia. "En parasol," "like an umbrella," is actually paired with "en auvent," "like a pent-house" or shed—a vivid enough simile for a laterally attached indusium—and Adanson included under the latter heading a genus (his *Filix*) with sori described as round. That is, he was contrasting indusia opening on one side with indusia opening all around, without regard to shape.

It may be, and has been, better argued that Adanson, like other botanists of his time, had not perceived the distinction between peltate and reniform indusia—a difference apparently first pointed out by Roth in 1799. This is undoubtedly true. The fact remains, however, that in describing his mixture of indusial forms, he used a phrase which, if taken at all literally, can mean only peltate—as Davenport remarks, "no one has ever known a parasol to have its handle otherwise than in the center, or to have its rim divided"—and that the single species which he cited does not have such an indusium. It was largely because of this discrepancy that Davenport (Rhodora iv. 163 (1902)) rejected *Dryopteris* and was followed therein by the editors of the seventh edition of Gray's Manual. And at least one pteridologist, Dr. J. B. Kümmerle of Budapest, takes the matter so seriously, that he follows[3] Adanson's description in prefer-

[1] Incidentally, we cannot accept Nakai's argument that since a plurality of the species referred by Adanson in his herbarium to *Dryopteris* have reniform indusia, the name may properly be used for the group so characterised, under Art. 45 of the International Rules. The provision of that article that, when a genus is divided, the name should go with the group containing the larger number of species can hardly be intended to apply to unpublished determinations of herbarium specimens, unknown to anyone but the maker of them. It refers only to published references of species to given genera. On the basis of publication, *Dryopteris*, like *Thelypteris*, was originally a genus of one species.

[2] It will be noted that Nakai, otherwise in agreement, finds it natural enough.

[3] See, for instance, Ann. Mus. Nat. Hungar. xxiv. 90 (1926) and Magyar Tudományos Akademia Balkán-kutatásainek, iii. 206–207 (1926).

ence to his citation of a representative species, and applies the name *Dryopteris* to *Polystichum* of Christensen, retaining *Nephrodium* for *Dryopteris* of Christensen.

Yet when, at Brussels in 1910, Harms proposed to conserve in place of *Dryopteris* the name *Nephrodium* Richard (1801 and 1803) which had much longer and more extensive use (in such general and standard works as Hooker and Baker's *Synopsis Filicum* and Diels's masterly treatment in *Die Natürlichen Pflanzenfamilien*) his proposition was voted down and by inference, at least, the misbegotten name *Dryopteris* was not ruled out. The name *Thelypteris* did not enter into the discussion, but surely if, as the Brussels Congress ruled, the nomenclature of the *Pteridophyta* must begin with the *Species Plantarum*, 1753 (not with Christensen's *Index Filicum* in 1906), we are obliged to take up *Thelypteris* Schmidel. To have to resuscitate it, with the ultimate necessity of scores or hundreds of new combinations, is undoubtedly a misfortune; but is no greater misfortune than was the exhumation of the equally disused *Dryopteris* from "the dust of synonyms," with the resultant 500 new combinations of the *Index Filicum* alone.

To sum up: By refusing to conserve *Nephrodium*, the Brussels Congress left the field open to the operation of the rule of strict priority. The priority of *Thelypteris* over *Dryopteris* has not been effectively questioned. Its publication is not perfect in form (as might be expected in a work first published in 1742 and only revised in 1762), but it appears to us adequate, and it is careful and accurate in substance. The publication of *Dryopteris* is correct enough in form, but careless and inaccurate in substance, so much so that diversity in its use exists. At worst, *Thelypteris* has claims enough to weigh on the consciences of careful followers of the rules; if *Dryopteris* is to be retained, with a clear title, it must be conserved by a botanical congress.

EXPLANATION OF PLATE 179

Schmidel's analytical details of THELYPTERIS, from Schmidel, Icon. Pl. ed. 2, t. 13 (1762).

II. A STUDY OF THELYPTERIS PALUSTRIS

M. L. Fernald.

(Plate 180.)

In our current manuals the Marsh Fern, which has been passing variously as *Aspidium Thelypteris* (L.) Sw., *Dryopteris Thelypteris* (L.) Gray or *Thelypteris palustris* (Salisb.) Schott, is distinguished from its closest relatives by the forking veins of the segments or pinnules of the fertile pinnae. Thus, in Gray's *Manual* the species, as *Aspidium Thelypteris*, is distinguished in the key from *A. simulatum* Davenp. merely by "Fertile veins once forked" and in the fuller description emphasis is placed on "*veins forked*, bearing the . . . fruit dots near their middle; indusium minute, smooth and naked;"[1] similarly in Britton & Brown's *Illustrated Flora* we find *Dryopteris Thelypteris* keyed out by "Veins once or twice forked," with the illustration clearly showing this point and the fuller text saying "veins regularly once or twice forked; . . . indusia small, glabrous."[2]

The essential identity of these American accounts of the venation of the fertile segments and the descriptions in European floras is striking. For example, in such an authoritative European work as Moore's *Nature-Printed British Ferns* we find the genus *Lastrea* in Great Britain broken into two sections, *Lastrea* § *Dryopteris* and *Lastrea* § *Thelypteris*, the latter section including *L. Thelypteris* and characterized by "*Veins usually forked, both branches* (*anterior and posterior venules*) *fertile;*"[3] while Moore's print from a fertile pinna shows the forking veins highly developed in all the median segments. Similar descriptions and illustrations of the venation of the fertile segments are found in all other detailed accounts of the European plant and the European specimens at hand clearly show many of the lateral veins of the fertile segments or pinnules to be forked (fig. 1). In fact, an actual count of the lateral veins of the anterior half of typical median *fertile* segments from median pinnae give a range of variation in the European plant as follows: from 2 forking and 4 simple to 7 forking and 3 simple, with an average of 4 veins forking and 4½ simple.

In northeastern America, however, from Newfoundland across

[1] Robinson & Fernald, in Gray, Man. ed. 7: 41 (1908).
[2] Maxon in Britton & Brown, Ill. Fl. ed. 2, i. 18, fig. 38 (1913).
[3] Moore, Nat.-Pr. Brit. Ferns (Octavo), i. 163, t. xxix (1859).

southern Canada as far west as southeastern Manitoba and south across the northern states to Georgia, Tennessee and Oklahoma, it is difficult to find true fertile segments of our Marsh Fern with many forking veins. In sterile fronds the veins are mostly forking and so they are, also, in sterile segments (particularly the basal ones) of fertile fronds; but, when median and well-developed segments of median fertile pinnae of the plant of northeastern America are examined, it will be found that the veins of their anterior halves are usually all or nearly all quite simple (fig. 7). Actual count in more than 200 numbers examined shows a range as follows: from 0 forking veins and 4 to 8 simple ones up to 3 forking and 7 simple, with an average of ½ a vein forking and 6 simple.

This tendency of the fertile segments of the Marsh Fern of northeastern America to have few forking veins but more numerous simple ones, although overlooked by most modern botanists, was clearly recognized by those early students of our flora who were unembarrassed by a large number of European specimens and unprejudiced by the very uniform descriptions of the European plant. Thus, on the label of his specimen from Essex County, Massachusetts, William Oakes wrote, a full century ago, "the lowest pair of veins only is most commonly forked, frequently *one* of the lowest veins only is forked, often a pair and a half or *two* of the lowest pairs are forked." Again, the masterly American phytographer, John Torrey, working with New York specimens, correctly described them in his *Flora of the State of New York*, as having "veins mostly simple, sometimes forked;"[1] and the late Charles Faxon, a modest but unusually keen observer, drawing the plate[2] of *Aspidium Thelypteris* for Eaton's *Ferns of North America* and showing "the common form in New England," gave diagrams of the venation: the sterile pinna with most of the veins forked, the fertile pinna with them mostly unforked below the indusia. Lastly, on a Rhode Island sheet from Professor J. F. Collins, I find the following comment: "lower veins of pinnules *forked*, occasionally some others; but most of them simple." But, for the most part, the makers of modern descriptions of the plant of northeastern America have found the descriptions of the European plant more convenient to copy and the result is, that, by emphasis upon a character rarely found in the American

[1] Torr. Fl. N. Y. ii. 497 (1843).
[2] C. E. Faxon in Eaton, Ferns N. A. ii. t. 30 (1879).

plant, the real distinctions between our *Thelypteris palustris* and the endemic American *T. simulata* (Davenp.) Nieuwl. are rendered unnecessarily doubtful. The key-character now found in our manuals should be greatly modified and the following substitute is proposed:

T. PALUSTRIS. Lateral nerves of the segments of the *sterile* fronds mostly forked, of the fertile simple or forked: indusia glabrous or coarsely glandular-toothed or long-ciliate.

T. SIMULATA. Lateral veins of the segments of both sterile and fertile fronds simple: indusia minutely glandular-ciliate.

Although the plant of northeastern America has the venation of the fertile pinnae much simpler than in typical European material, we have in the extreme southeastern states and in Bermuda a plant with veins quite as generally forked as in the European. All the material I have seen from Louisiana, Florida and Bermuda has most of the veins of the fertile pinnae forked (fig. 5). This material shows a range of variation as follows: from 3 forking veins and 6 simple ones to 6 forking and 2 simple, with an average of 4 forking and 4 simple, an average not very unlike that of the European series. Some plants, with several forking fertile veins occur northward to southeastern Pennsylvania and occasional individuals from further north have a few fertile segments with numerous forking veins. But north of Louisiana and Florida the species certainly shows a general reduction in the number of forked veins. Typical segments of three of these plants, the European (fig. 1), the northeastern American (fig. 7) and the southeastern American (fig. 5) are shown in the outline drawings prepared by Miss Ethel C. Dansie.

The descriptions of the indusia in American manuals and in European handbooks are so different that, coupled with the difference in venation already discussed, they might very naturally be taken as characterizing distinct European and northeastern American species. The statements in Gray's *Manual* and in Britton & Brown's *Illustrated Flora* have already been quoted: "indusium minute, smooth and naked" and "indusia small, glabrous." Such characterizations are typical in America; and when we turn to European descriptions and illustrations we likewise find a remarkable uniformity of statement, but one seemingly incompatible with the American. Thus, the analytical drawings published by Schmidel[1] (see PL. 179) with his original account of *Thelypteris* show the indusia with coarse gland-tipped teeth; and in his description Schmidel strongly emphazised

[1] Schmidel, Icones Plantarum, ed. 2, t xiii (1762).

them: "Quandiu peltae iuniores et vegetae adhuc sunt, apicibus lacinularum, non quidem omnium in omnibus, plurimarum tamen, inhaerere solent globuli parui, crocei dilutioris coloris, propter succum quem continent viscidulum splendidi. Ex his vnus post alterum sensim euanescunt, postquam ad aliquod tempus durauerunt." Similarly, in the very clear analytical plate in his incomparable *Kryptogamische Gewächse*, Christian Schkuhr showed the characteristic European plant with practically all the fertile veins forking and with the indusia bearing conspicuous glands at the tips of the coarse teeth: "Die Fruchtdecken . . . sind am Rande mit gestielten Drüsen besetzt."[1] Or, again, in Moore's *Nature-Printed British Ferns*, already referred to, the illustration brings out the glandular ciliation and the text emphasizes it: "*Indusium* a small delicate roundish-reniform membrane, . . . the free margin lacerate and glandular"; and Luerssen goes still farther, describing not only the gland-tipped teeth, but also glands between the teeth and longer unicellular hairs occurring irregularly on the indusia.[2] When the young and unshrivelled indusia of the European plant (fig. 2) are examined they are found to agree perfectly with the best European descriptions, in having coarse teeth tipped by conspicuous yellow or orange glands and only rarely (in a single collection seen by me, of *Dryopteris Thelypteris*, forma *Rogaetziana* (Bolle) Holmberg) do they have the very long cilia described by Luerssen. This European type, with fertile veins mostly forking and with indusia with coarse gland-tipped teeth, extends southward to the Mediterranean and eastward to India and southern China.

In the plant of northeastern America, on the other hand, the indusia (fig. 8) are mostly larger than in the European type (the best-developed measuring 0.7-1 mm. in diameter) and less lacerate or long-toothed. Only rarely are they so glandular-ciliate, occasionally they have a few glands, but the great majority of them examined (from a series of fully 200 numbers) are either quite glabrous and without ciliation or glabrous on the back and ciliate with few to many long slender trichomes. It is clear, then, that, although strikingly similar in aspect to European *Thelypteris palustris*, the

[1] Schkuhr, Krypt. Gew. 52, t. 52 (1809).

[2] "am Rande unregelmässig kurz-lappig bis stumpf-zähnig und auf der Spitze der Lappen oder Zähne sowie auch zwischen denselben mit kurzen, cylindrisch-keuligen bis keulenförmigen drüsigen Härchen und dazwischen längeren pfriemenförmigen, einzelligen Haaren in sehr wechselndem Verhältniss besetzt."—Luerrsen, Farnpfl. 364 (1889).

plant of northeastern America differs from it in having the veins of the fertile pinnae usually simpler and the larger indusia rarely so glandular-ciliate but more often glabrous or long-ciliate and without conspicuous glands. In one other tendency does it show a strong departure: in commonly having the rachis (at least when young), the midribs of the pinnae and the veins (especially beneath) minutely and rather densely pubescent, the frond of the European plant being nearly or quite glabrous. The pubescence is not always conspicuous in our plant but in nine-tenths of our material it is well developed and the plant of northeastern America is obviously what was intended by the late George Lawson when he designated "the plant of Gray's Manual" as

"*Lastrea Thelypteris*, α. *pubescens*.—Frond somewhat coriaceous, densely pubescent or downy throughout."[1]

And naturally enough, though like all other such cases coming as a fresh surprise, when the venation of the fertile fronds (fig. 9) and the characters of the indusia (fig. 10) of all available material from northeastern Asia (5 collections from Manchuria and Amur) are examined, they show that the plant of Amur and Manchuria is indistinguishable from that of northeastern America. It is, furthermore, noteworthy that Christensen, studying the ferns brought back from Kamtchatka by Hultén, should have set off as "a most striking variety" the plant of South Kamtchatka: *Dryopteris Thelypteris*, "var. **kamtschatica** C. CHR. nov. var. . . . Frons longe stipitata rigida, lamina utrinque pubescente subtus squamis et glandulis destituta,"[2] with the additional comment "indusia rather large and persistent." Christensen's *D. Thelypteris*, var. *kamtschatica*, like the plant of Amur and Manchuria, is pretty clearly the same as *Lastrea Thelypteris*, var. *pubescens* Lawson. Var. *kamtschatica*, besides its pubescent and esquamose and glandless character was "especially marked by . . . , short blade; frequently the stipe is 30 cm. or more, the lamina [fertile] 10 cm. long and only 5-6 cm. wide"

[1] Lawson, Edinb. New Phil. Journ. n. s. xix. 277 (1864)—Reprinted as Syn. Can. Ferns and Fil. Pl. 21 (1864). Lawson's plant came from "Odessa, Hudson's Bay, & c." This does not mean that the fern reaches northward to Hudson Bay as might naturally be inferred. Hudson's Bay Territories in Lawson's day embraced all the vast unincorporated and undeveloped area now called Canada from the Atlantic to the Pacific and north of the St. Lawrence and the Great Lakes. It even included "the neighborhood of Montreal, up the Ottawa River," etc. (Lippincott's Gazetteer). The Odessa of Lawson, which may be taken as the type-station, is slightly north of latitude 44° N. in Addington Co., Ontario. His "Hudson's Bay" might have been anywhere in southeastern Ontario or southwestern Quebec.

[2] Christens. in Hultén, Fl. Kamtch. and Adj. Isl. i. 38 (1927).

and it was found only in "alkaline?" soil near a hot spring. In the plant of northeastern America it is not difficult to find stipes up to 7 dm. in length and in many plants the fertile lamina is but slightly more than one-third the length of the stipe. In fact, such a collection as *Bissell & Linder*, no. 19,402 from "brackish marsh," George River, Nova Scotia, must be a very close match for the type of var. *kamtschatica;* the George River specimen preserved in the Gray Herbarium having two fertile fronds: one with stipe 37 cm. long and lamina 13 cm. long and 7.5 cm. broad, the other with the lamina 15 cm. long and 6 cm. broad.

From Christensen's observation upon the Kamtchatkan plant, above quoted, one would infer that the proportions of stipe and lamina in the eastern Asiatic and the European plants are notably different. Without a larger and better-collected representation than I have seen from Europe I am unable to say whether the northeastern American and the European plants actually differ in these points. Lawson (l. c.) said: "In the Canadian plant the outline of the frond is a little different from Scotch and Irish specimens, being less narrowed at base." The European works, to quote from Moore's detailed account again, describe the "*Stipes* as long as or longer than the leafy portion in the fertile fronds. . . . Fronds . . from four to ten inches in breadth," and the European representation before me shows the fertile lamina ranging from 0.7 to 2 dm. in width (Moore's "ten inches" would be 2.45 dm.), with stipes up to 5 dm. long. In the plant of northeastern America the stipes often reach a length of 7 dm. (probably not really different in Europe) and the fertile laminas of the more than 200 numbers before me give a range in breadth of 0.4 to 1.7 dm. (with two collections from rich calcareous meadows showing the extraordinary breadth of 1.9 dm. and 2.1 dm. respectively), the average breadth of the 200 + laminas being 1.07 dm. Whether this average is less than in Europe I cannot say; judging from European descriptions and illustrations, apparently it is.

When we turn to the plant of the southeastern United States and Bermuda, with venation (fig. 5) as in the typical *Thelypteris palustris* of Europe and western and south-central Asia, we find an indusium (fig. 6) essentially like that of the northeastern American and northeastern Asiatic *Lastrea Thelypteris*, var. *pubescens* of Lawson, with few, if any, glands but with elongate non-glandular ciliation and in

size practically like the European indusia. This southern plant, it would seem, is as closely related to the more northern American extreme as it is to the European; and in the usual abundance of long cilia on the indusia they both strongly suggest the still more austral *T. palustris*, var. *squamigera* (Schlecht.) Weatherby[1] of southern India, tropical and southern Africa and northern New Zealand. In var. *squamigera* (fig. 3) there is a greater development of broad brown scales on the lower side of the costa of the pinna than is common in the more northern plants; but small (though narrower) scales may be found on young and carefully preserved European and American specimens, and in the plants of Louisiana and Bermuda they are as abundant and nearly as broad as in African specimens. The plant of southeastern North America, however, can scarcely be referred to var. *squamigera*. Such material of the African and New Zealand plant as I have examined (only three or four of the sheets showing young indusia) has the indusia (fig. 4) with copious dorsal as well as marginal long trichomes; the southeastern American plants having the indusia essentially glabrous on the back and the frond more definitely bipinnate than in the other varieties.

Thelypteris palustris, a semi-cosmopolitan species, has, then, four strongly marked varieties which may be distinguished as follows.

T. PALUSTRIS (Salisb.) Schott, var. **typica**. *Acrostichum Thelypteris* L. Sp. Pl. ii. 1071 (1753). *Polypodium Thelypteris* (L.) Weis, Pl. Crit. Fl. Gott. 307 (1770). *P. palustre* Salisb. Prodr. 403 (1796). *Polystichum Thelypteris* (L.) Roth in Roem. Arch. ii. pt. 2: 106 (1799). *Aspidium Thelypteris* (L.) Sw. in Schrad. Journ. 1880, pt. 2: 33 (1801). *Athyrium Thelypteris* (L.) Spreng. Anleit. iii. 134 (1804). *Aspid. palustre* (Salisb.) S. F. Gray, Nat. Arr. Brit. Pl. ii. 9 (1821). *Nephrodium Thelypteris* (L.) Strempel, Fil. Berol. Synop. 32 (1822). *Lastrea Thelypteris* (L.) Bory, Dict. Class. ix. 233 (1826). *T. palustris* (Salisb.) Schott, Gen. Fil. in Obs. under t. 10 (1834). *Aspid Thelypteris* Wood, Class-Book, 459 (1845) as to name-bringing syn. *Dryopteris Thelypteris* (L.) Gray, Man. 630 (1848), as to name-bringing synonym. *Hemestheum Thelypteris* (L.) Newm., Phytol. iv. Append. xxii (1851). *Lastrea palustris* (Salisb.) J. Sm. Cat. Cult. Ferns, 56 (1857). *T. Thelypteris* (L.) Nieuwl. Am. Midl. Nat. i. 226 (1910), as to name-bringing synonym.—Fertile lamina 0.7–2.5 dm. wide, glabrous or only sparingly pubescent: scales on back of rachis and midribs lanceolate to oblong, caducous: segments of median fertile pinnae with about half the veins forking (of those of the anterior half 2–7 forking, 3 or 4 simple): indusia with coarse gland-tipped

[1] Weatherby in Johnston, Contrib. Gray Herb. no. lxxiii. 40 (1924).

teeth, only rarely with long glandular ciliation.—Great Britain, southern Norway, central Sweden, northern European Russia (Perm) and lat. about 58° in western Siberia eastward in Asia and south to northern Spain, Algiers, central Italy, the Caucasus, the Himalayas and southern China. FIGS. 1 and 2.

Var. SQUAMIGERA (Schlecht.) Weatherby in Johnston, Contrib. Gray Herb. lxxii. 40 (1924). *Aspidium Thelypteris*, β. *squamigerum* Schlecht. Adumb. 23, t. 11 (1825). *A. squamulosum* Kaulf. ex Schlecht, l. c., in syn. (1825). *Lastrea squamulosa* Presl, Tent. 76 (1836). *Nephrodium squamulosum* (Presl.) Hook. f. Fl. N. Zeal. ii. 39 (1855). *A. Thelypteris*, β. *squamuligerum* Mett. Abh. Senckenb. Naturf. Ges. ii. 112 (1855). *N. Thelypteris*, β. *squamulosum* (Presl) Hook. Sp. Fil. iv. 88 (1862). *Lastrea Fairbankii* Bedd. Ferns Brit. Ind. t. 254 (1867). *N. Thelypteris*, var. β. *squamuligerum* (Mett.) Sim, Ferns S. Afr. 180 (1892). *Dryopteris Thelypteris*, var. β. *squamuligera* [as *um*] Sim, l. c. ed. 2: 102 (1915).—Fertile lamina 0.5–1.5 dm. wide; scales of rachis and midribs reniform, suborbicular or broad-ovate, castaneous or fulvous, rather persistent: veins of median fertile pinnae mostly simple: indusia copiously long-ciliate and commonly with shorter glandular ciliation and often pilose-hirsute on the back.—India, tropical and southern Africa, northern New Zealand. FIGS. 3 and 4.

Var. **Haleana**, n. var., frondibus plerumque bipinnatis medio 0.8-2 dm. latis; pinnarum costa media squamis paleaceis obtecta, squamis ovatis obtusis castaneis vel fulvis persistentibus vel caducis, pinnularum fructiferum nerviis plerumque furcatis; indusio longe ciliato vix glanduloso.—Southeastern United States and Bermuda Islands. LOUISIANA: marshes, Alexandria, *Josiah Hale* (TYPE in Gray Herb.). FLORIDA: Palma Sola, *S. M. Tracy*, no. 6627; Deep Lake, Lee Co., *A. A. Eaton*, no. 1312; Miami, May, 1877, *A. P. Garber* (as *Aspidium unitum*); Black Point, Dade Co., *A. A. Eaton*, no. 277; Alapattah, *A. A. Eaton*, no. 1007; Biscayne Bay, *E. Palmer*, no. 652; New Smyrna, *Palmer*. BERMUDA: Pembroke Marshes, June 21, 1905, *Harshberger*, August 23, 1913, *F. S. Collins*, no. 122; Devonshire Marshes, *Brown & Britton*, no. 84. Specimens from Georgia, eastern Virginia and southeastern Pennsylvania show more simple veins and seem to indicate transition to the next. FIGS. 5 and 6.

Var. **pubescens** (Lawson), n. comb. *Lastrea Thelypteris*, α. *pubescens* Lawson, Edinb. New Phil. Journ. n. s. xix. 277—reprinted as Syn. Can. Ferns and Filic. Pl. 21 (1864). Lawson's *L. Thelypteris*, β. *glabra* likewise belongs here, but his γ. *intermedia* (judging from the locality) may be different. *Dryopteris Thelypteris*, var. *kamtschatica* C. Chr. in Hultén, Fl. Kamtch. and Adj. Isl. i. 38 (1927).—Fronds usually minutely pubescent, at least when young, on both surfaces and especially along the rachis and lower sides of the midribs, mostly without scales or when young with pale narrow caducous scales; fertile fronds 0.4–1.7 (rarely– 2.1) dm. broad; the median fertile

segments with the veins all or nearly all simple: indusia when well developed 0.7–1 mm. in diameter, glabrous or long-ciliate, rarely glandular-ciliate.—Southeastern Newfoundland and the Magdalen Islands to the Ottawa Valley, Quebec, west to southeastern Manitoba and south to Georgia, Tennessee and Oklahoma (and Texas ?); southern Kamtchatka, Amur and Manchuria. TYPE-STATION: Odessa, Addington Co., Ontario (*Lawson*). FIGS. 7–10.

Phylogenetically the typical Eurasian plant, *Thelypteris palustris*, var. *typica*, seems to be farthest removed from the other varieties, in having the indusium more glandular-toothed but less often with long glandless ciliation than in the other three varieties. In this connection it is noteworthy that the European plant is distinctly not a boreal fern, there reaching its northern limit in Perm, central Sweden, southernmost Norway[1] and Great Britain and Ireland, where, in the northern and western districts it is sufficiently local to have led Moore (in 1859) to write: "Though widely dispersed in the United Kingdom, the Marsh Fern is a comparatively rare plant, being local in occurrence . . . The only Scottish county in which there is certain information of its occurrence is Forfarshire; and the recorded habitats in Ireland are few."[2] Other localities are now known, but the main point is clear, that in Europe the species is not primarily a boreal one. In Asia too, its northwestern limit (acc. to Christensen in Hultén) is near Tobolsk, and southward it reaches Algeria, central Italy, Crimea, the Caucasus, southern Turkestan, the Himalayas and southern China. In brief, var. *typica* belongs to temperate Eurasia.

Similarly, var. *pubescens*, the almost ubiquitous Marsh Fern of eastern America, is not boreal, reaching its northern limits near the southern borders of eastern Canada and Newfoundland but extending south into the Southern States; while var. *Haleana* is in a warm-temperate to sub-tropical belt, its northernmost extension on the Bermudas, its southernmost on the Florida Keys. The other variety, var. *squamigera*, occurs in southern India, tropical and southern Africa and on the North Island of New Zealand. In all three of these varieties, the plants of tropical, subtropical and temperate regions of the Southern Hemisphere and of eastern America and northeastern Asia, the preponderance of long glandless ciliation over short glandularity of the indusia is striking and it seems probable that the original form of the species was a plant of tropical or sub-

[1] Holmb. Hartm. Handb. Skand. Fl. revised by Holmb. i. 11 (1922)
[2] Moore, Nat.-Pr. Brit. Ferns (Octavo) i. 167, 168 (1859).

tropical regions, such as vars. *squamigera* and *Haleana* and that the more northern var. *pubescens* and still more extreme var. *typica* have been of later origin.

Explanation of Plate 180

Varieties of Thelypteris palustris; outlines and venations of pinnae × 1½, outlines of indusia × 50. Figs. 1 and 2, var. typica; fig. 1 from Sweden, coll. *Hugo Granvik*, fig. 2 from Bavaria, *Reinsch*, no. 398. Figs. 3 and 4, var. squamigera, both from Natal, coll. *S. L. Abraham*, 1865–6. Figs. 5 and 6, var. Haleana, both from the type, Alexandria, Louisiana, *J. Hale*. Figs. 7–10, var. pubescens; fig. 7 from Shelburne, New Hampshire, coll. *W. Deane*, August 19, 1915, fig. 8 from Stottville, Quebec, coll. *G. G. Kennedy*, July 23, 1863, figs. 9 and 10 from Amur, coll. *S. Korshinsky*, 1891.

(To be continued)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXIII.

(*Continued from page 36.*)

III. FOUR GRASSES OF EASTERN AMERICA

M. L. Fernald

Poa **labradorica**, n. sp., perennis rhizomate repente; foliis imis marcescentibus subcoriaceis rosulatis, vaginis subinflatis chartaceis valde carinatis circa 14-costatis 1.5–4 cm. longis, ligulis brevissimis truncatis, laminis 0.5–1.5 dm. longis 3–6 mm. latis subrigidis valde plicatis vel convolutis apice subulatis; foliis caulinis 2–4 remotis, lamina suprema falcata subrigida subacerosa 4–7 cm. longa, ligulis chartaceis 2.5 mm. longis; culmo solitario stricto tereti 1.5–4 dm. alto glabro crasso ad basin 2.5–4 mm. diametro; panicula stricta 6–12 cm. longa 0.7–2 cm. diametro ramis coarctatis glabris; spiculis ellipticis purpurascentibus vel stramineis valde compressis 5.5–9 mm. longis 2–3-floris; glumis coriaceis valde carinatis glabris ovato-lanceolatis acuminatis margine apiceque albido-hyalinis, gluma inferiore 4.5–5.5 mm. longa, superiore 5–7.5 mm. longa; rhachilla deinde elongata flexuosa glabra; lemmatibus lanceolatis 4–5 mm. longis 5–7-nerviis supra glabris basin versus pilosis apice late hyalinis deinde erosis vel fimbriatis; palea lineari-lanceolata bicarinata, carinis scabris, apice bifida; antheris linearibus 2 mm. longis.—East coast of Labrador: Nain, August 11, 1897, *J. D. Sornborger*, no. 239, distributed as *P. eminens* (type in Gray Herb.); Bowdoin Harbor, July 25–August 4, 1927, *C. S. Sewall*, no. 111; Jack Lane's Bay, July, 1927, *Sewall*, no. 201; Anatolak, June–August, 1928, *Sewall*, nos. 426, 428.

The type of *Poa labradorica*, long separated off in the herbarium as a distinct species, is now reinforced by the four collections made by Mr. Sewall in the same general region, the area centering on Nain. These form a thoroughly consistent series, clearly distinct from *P. eminens* Presl in many characters. The latter is a very glaucous plant, with much broader and flat whitish leaves (up to 1.5 cm. broad) and stouter (up to 9 mm. thick) culms, the uppermost cauline leaf with blade 1–3 dm. long; *P. labradorica* being scarcely if at all glaucous, with strongly convolute green leaves 3–6 mm. wide, with culms at most 4 mm. thick and with the blade of the uppermost leaf only 4–7 cm. long. In *P. eminens* the dense or lax panicles are 0.8–3.3 dm. long, 2–10 cm. in diameter, in *P. labradorica* 6–12 cm. long and only 0.7–2 cm. thick. In *P. eminens* the spikelets are large, 3–5-flowered, with the ovate glumes up to 11 mm. long and scabrous on the keel, the ovate lemmas scabrous to or essentially to the tip;

in *P. labradorica*, with 2–3-flowered spikelets, the more lanceolate glumes glabrous throughout and at most 7.5 mm. long, the much narrower lemmas glabrous except at the pilose base.

Although Scribner & Merrill have proposed *Poa Trinii* Scrib. & Merr., Contrib. U. S. Nat. Herb. xiii. 73 (1910) as a second species related to *P. eminens*, it is clear that *P. labradorica* cannot be referred to *P. Trinii*. In fact, I am quite unable to separate the latter from *P. eminens*. The characters used by Scribner & Merrill are not

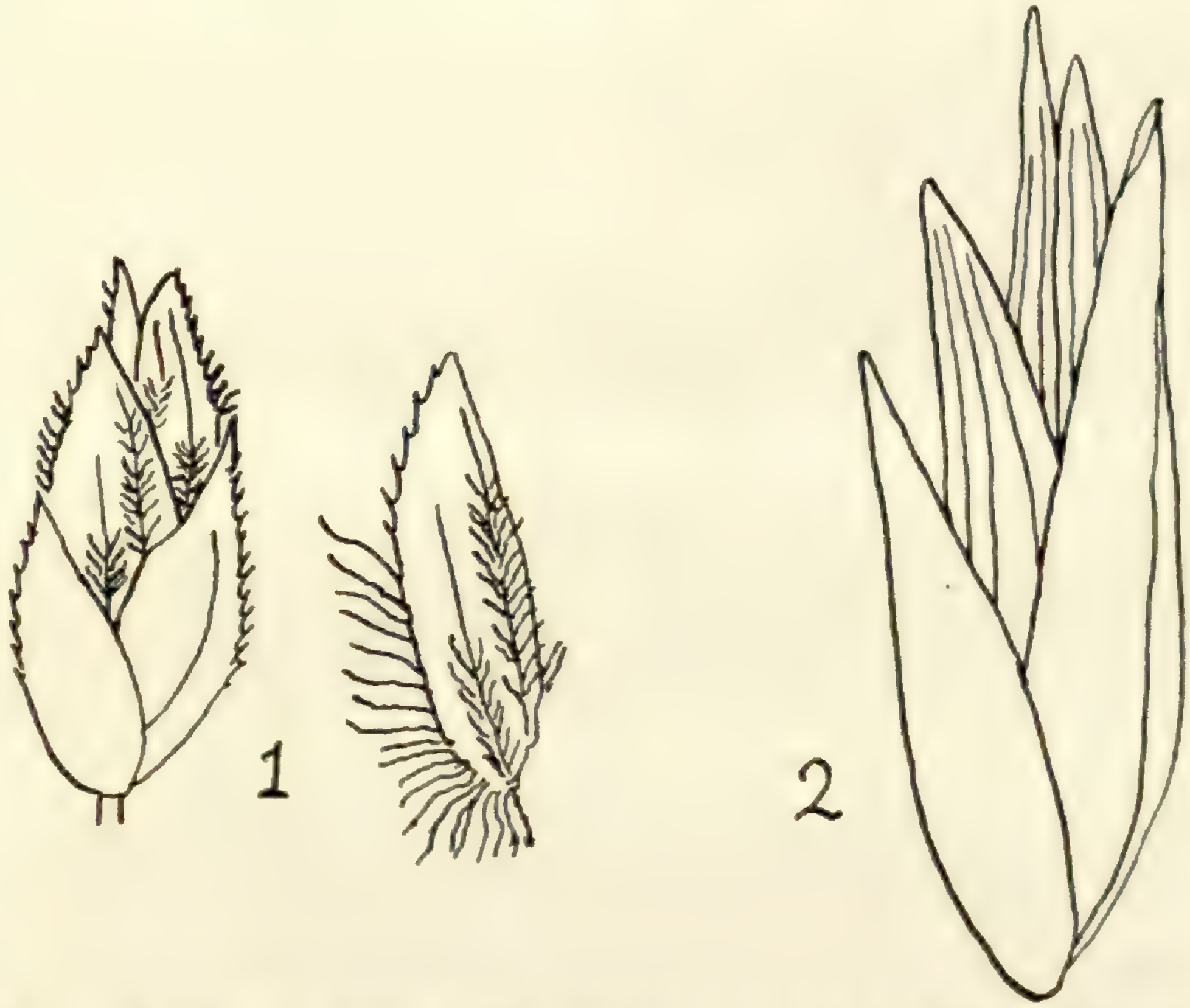

FIG. 1, spikelet and lemma of *Poa gaspensis* × 10; FIG. 2, spikelet of *P. labradorica* × 10.

constant and the specimens they cite, including the type, are readily matched in the variable series from single colonies of *P. eminens*.

Poa macrocalyx Trautv. & Meyer, Fl. Ochot. Phaenog. 103 (1856) has foliage and spikelets somewhat suggesting those of *P. labradorica* and Hultén, Fl. Kamtch. and Adj. Isl. i. 128 (1927) speaks of his specimens as "collected on the seashore, where they grow in the *Elymus* belt or in the subalpine meadows usually found inside that belt, often together with *P. eminens*." We have no record of the exact habitat of *P. labradorica*, but from its habit and aspect it is presumably the same as that of the related *P. eminens* and *P. macro-*

calyx. *P. labradorica* cannot be placed in the latter species: *P. macrocalyx* has the branches of the panicle very scabrous-hirtellous and loosely spreading, the branches in *P. labradorica* being glabrous and closely appressed; in *P. macrocalyx* the keel and lateral nerves of the lemma are densely silky-pubescent, in *P. labradorica* glabrous.

Poa **gaspensis**, n. sp., plus minusve dense caespitosa, culmis numerosis teretibus glabris strictis 1.5–5 dm. altis basi vaginis foliorum emortuum scariosis brunneis vestitis; caudicibus novellis foliosis, foliis erectis anguste linearibus 1–2 (in umbra –3) dm. longis 1–4 mm. latis utrinque scabridulis vel glabris apice acutis vel subacutis calloso-cucullatis, ligulis truncatis 0.5 mm. longis; foliis caulinis 2 vel 3 latioribus brevioribusque, vaginis arctis lamina valde longioribus, laminis 1.5–8 cm. longis 2–5 mm. latis, ligulis 2–6 mm. longis; panicula subcylindrica vel anguste ovoidea 3–12 cm. longa 0.6–6 cm. diametro, ramis capillaribus remotis glabris vel scabrellis divergentibus vel adscendentibus, ad apicem floriferis; spiculis anguste ovatis valde compressis 3–5 mm. longis pedicellatis 3–4-floris; glumis hyalinis lucidis ovatis acuminatis 3-nerviis margine late albescentibus carina ciliatis, superiore 2.8–4.5 mm. longa; lemmatibus hyalinis albido-marginatis acutis vel subacutis 2.5–4.5 mm. longis 5-nerviis, nervo medio supra mediam longe piloso ad apicem scabro-ciliato, nervo marginali supra mediam longe piloso, nervo intermedio ad basin piloso; antheris 1.2–1.4 mm. longis.—Gaspé County, Quebec: wooded alluvial banks and gravelly and sandy beaches and bars of River St. Anne des Monts, July 14–16, 1906, *Fernald & Collins*, nos. 343, 344 (type in Gray Herb.), 345, 347, 356, 358. No. 339 from sienitic rock-slides, Table-topped Mountain, August 9–11, 1906, probably belongs here but has extremely large spikelets.

Poa gaspensis has the habit of *P. alpina* L., *P. paucispicula* Scribn. & Merr. and *P. bracteosa* Kom. From *P. alpina* it is at once distinguished by its more slender caudices, narrower leaves, longer and narrowed glumes and more hyaline glumes and lemmas, the latter with the long pilosity of the nerves running much higher. *P. paucispicula* of Alaska has the second glume with a smooth keel; the lemmas nearly smooth, except for pilosity toward the base. *P. bracteosa* of Kamtchatka is described as having the glumes and lemmas glabrous (except for the cobweb at base of the latter) and Hultén states that the anthers are 2–2.5 mm. long (in *P. gaspensis* less than 1.5 mm.).

Some specimens of *Poa gaspensis* suggest *P. alpigena* (Hartm.) Lindm. f., which abounds on the Gaspé Peninsula and is highly variable, a loosely stoloniferous species; others suggest *P. alpina*, which is also abundant in the region. It is possible that *P. gaspensis* may have originated through crossing of these two dominant species,

but along the Ste. Anne des Monts it is now a common and characteristic plant. It is there associated with other endemics of the Ste. Anne valley, which are not closely related to other species in the region: *Salix chlorolepis* Fern., *S. obtusata* Fern., *Fragaria multicipita* Fern., *Solidago mensalis* Fern. and *S. chlorolepis* Fern., and with still other near-endemics (known in the Ste. Anne valley but also in other adjacent areas) such as *Salix hebecarpa* Fern., *Arenaria marcescens* Fern., *Ranunculus Allenii* Robins., *Saxifraga gaspensis* Fern. and *Vaccinium nubigenum* Fern. These are, for the most part, local representatives of species of western North America, Siberia or the Arctic; and *Poa gaspensis* seems to belong with them in having its nearest affinity with two species of the North Pacific region, *P. paucispicula* of Alaska and *P. bracteosa* of Kamtchatka.

GLYCERIA STRIATA (Lam.) Hitchc., var. **stricta** (Scribn.), n. comb. *Panicularia nervata stricta* Scribn. in Nelson, U. S. Dept. Agric. Div. Agrost. Bull. xiii. 44 (1898). *P. nervata rigida* Nash in Rydb. Mem. N. Y. Bot. Gard. i. 54 (1900). *G. nervata stricta* Scribn. acc. to Nash, l. c. as syn. (1900). *G. nervata rigida* (Nash) Lunell, Am. Midl. Nat. iv. 223 (1915). *P. rigida* (Nash) Rydb. Fl. Rocky Mts. 83, 1060 (1917). *P. nervata*, f. *stricta* (Scribn.) House, Bull. N. Y. State Mus. ccliv. 118 (1924), at least as to name-bringing synonym.

It has recently been pointed out by Professor A. S. Hitchcock, that the common plant of eastern America which we have been calling *Glyceria nervata* (Willd.) Trin. (1830) has an earlier specific name and he, therefore, publishes the combination *G. striata* (Lam.) Hitchc.[1] The new combination goes back to *Poa striata* Lam. Tabl. Encycl. i. 183 (1791), while *G. nervata* rests upon *Poa nervata* Willd. Sp. Pl. i. 389 (1797). Lamarck's plant came from Virginia and is, unquestionably, the common grass of the eastern United States. My purpose in this note is to direct attention to its more boreal representative which occurs across the continent northward, from Labrador to Alaska, southward into the northernmost states and along the Rocky Mountains to New Mexico and Arizona and even into Mexico. This is the grass distinguished very inadequately by Scribner as *Panicularia nervata stricta* and variously treated by other students: as a species, *P. rigida*, by Rydberg; as a mere form by House, and as not worthy any recognition at all by Hitchcock.[2]

[1] Hitchc. Proc. Biol. Soc. Wash. xli. 157 (1928).

[2] Hitchc. in Abrams, Ill. Fl. Pacif. States, i. 213 (1923), where the variety, which alone occurs in Washington and Oregon, is not mentioned and an illustration of the eastern plant, borrowed from Britton & Brown, is used to represent the very different western one.

The very different interpretations of var. *stricta* above indicated are clear evidence that the plant is not generally well understood. The only author who has given a good account of it is Rydberg, whose excellent diagnostic characters clearly indicate that he has studied the plants:

Leaf-blades flat and lax; lemma slightly scarious-margined; branches of the inflorescence long; empty glumes obtuse..1. *P. nervata.*
Leaf-blades conduplicate, stiff, ascending; lemma distinctly scarious-margined; branches of the inflorescence short, strongly ascending, not drooping.....3. *P. rigida.*

And again: P. NERVATA with stems 3–10 dm. high, leaf-blades 1.5–3 dm. long, 4–10 mm. wide, scabrous above, panicle 7–20 cm. long; P. RIGIDA with stems 3–4 dm. high, leaf-blades 5–15 cm. long, 3–4 mm. wide, panicle about 1 dm. long, lemma rounded-oval, usually purplish.

Although separating *Panicularia rigida* as a plant of the Rocky Mts., Rydberg did not go far enough, for it is the wide-ranging northern representative of *Glyceria striata* (*G. nervata*); and in extending the range of the latter to Alaska he was including much which belongs with the former.

In the field and in the herbarium I have long recognized the two extremes as either very strong varieties or fairly distinct species and a re-study of the material confirms these earlier decisions. In view, however, of the too frequent breaking down of characters it seems to me better to express the facts, to treat them as extreme geographic varieties. Some points, not emphasized by Rydberg, should be further stressed and I should distinguish the two as follows:

G. STRIATA. Culms 0.3–1.5 m. high: leaves flat, up to 1 cm. broad, harsh above; the uppermost with blade 1–3 dm. long: panicle 1–3 dm. long, lax and open, the loosely ascending branches in age becoming divergent or sometimes even reflexed: spikelets greenish, rarely purplish: lemmas barely if at all scarious-tipped.—Eastern United States, extending north to southern Ontario, southern Quebec, Prince Edward Island, Cape Breton Island (Nova Scotia) and southern Newfoundland, commonly in boggy or peaty meadows, swales and thickets.

Var. STRICTA. Culms usually lower, 0.2–0.9 m. high, and more slender: leaves flat or conduplicate, up to 5 mm. broad, smooth or barely scabrous above; the uppermost with blade 0.3–2 dm. long: panicle 0.5–1.5 (rarely –2) dm. long, with the branches strongly ascending, only rarely divergent or reflexed in age: spikelets purple, rarely green, commonly larger: lemmas more rounded, with broad scarious tip.—Hamilton Inlet, Labrador to Alaska, south to Newfoundland, Nova Scotia, Maine, northern New Hampshire, western

Massachusetts, central and western New York, northern Illinois, Iowa, South Dakota, New Mexico, Arizona and Oregon, and in Mexico to Hidalgo; commonly in rich or calcareous soils.

GLYCERIA **arkansana,** n. sp., ab *G. septentrionali* differt culmis crassis 1 cm. diametro; foliis flaccidis 1–1.8 cm. latis subtus laevibus supra scabridulis, ligulis hyalinis 1 cm. longis; paniculis 4–7 dm. longis, ramis laevibus adscendentibus deinde divergentibus; spiculis linearibus 10–15-floris 1.5–2 cm. longis; glumis oblongo-ovatis laevibus subcoriaceis, superiore 2.5–3.5 mm. longa; lemmatibus membranaceis oblongo-ovatis subacutis 2.5–3 mm. longis hirtellis valde 7-costatis.—Arkansas and Louisiana. ARKANSAS: common in swamp, Varner, Lincoln County, April 29, 1898, *B. F. Bush*, no. 9, as *Panicularia fluitans* (TYPE in Gray Herb.). LOUISIANA: without definite locality, *Hall*, no. 685; infrequent in wet ground, Gretna, May 10, 1899, *C. R. Ball*, no. 362, as *Panicularia fluitans*.

Glyceria arkansana is a coarser plant than *G. septentrionalis*, with broader and more flaccid leaves and larger panicles. Yet, its strongest characters are in the smaller and more delicate spikelets. In *G. septentrionalis* the glumes are firmer, the upper one 4.5–5.7 mm. long (in *G. arkansana* 2.5–3.5 mm.). The coriaceous lemmas of *G. septentrionalis* are 3.6–5.5 mm. long, scabrous-puberulent and only obscurely 7-nerved; the lemmas of *G. arkansana* only 2.5–3 mm. long, thin or membranaceous, definitely hirtellous and very sharply and prominently nerved. *G. fluitans* (L.) R. Br., to which *G. arkansana* is likewise related, has the glumes and lemmas as large as in *G. septentrionalis* but the lemmas thinner and less pubescent; *G. borealis* (Nash) Batchelder has as small and as delicate spikelets as *G. arkansana* but the lemmas quite glabrous; and *G. leptostachya* Buckl. and *G. acutiflora* Torr., though of the same group, are so different as scarcely to need comparison with the plant of Arkansas and Louisiana.

(*To be continued*)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.—No. LXXXIII.

(*Continued from page 49.*)

IV. THE REPRESENTATIVES OF ELEOCHARIS PALUSTRIS IN NORTH AMERICA.

M. L. Fernald and A. E. Brackett.[1]

(Plates 181–184.)

Probably no group of the *Cyperaceae* in the flora of temperate North America has been more baffling to the student of local floras than the complex of plants which have passed as *Eleocharis palustris* (L.) R. & S. The present study of the group, begun in 1925, has been much interrupted and often quite discouraging, especially from the fact that plants superficially very similar have obviously different achenes and tubercles; it has consequently been necessary, before roughly classifying our plants, to study the achenes of each, and in too many instances the specimens are immature or sterile. Our study started as an attempt to get a clearer insight into the representatives of *E. palustris* in New England, eastern Canada and New-

[1] Amelia Ellen Brackett (1896–1926), born at North Berwick, Maine, October 4, 1896, died at Boston, Massachusetts, May 31, 1926. Miss Brackett graduated from Radcliffe College in 1920 and received her master's degree from Radcliffe in 1921. At the time of her sudden and fatal illness (appendicitis) she was preparing to present herself for the doctorate. Miss Brackett had been temporarily employed as nomenclator at the Harvard Botanic Garden, as botanical artist at the Gray Herbarium, and at the time of her death she was general assistant in the herbarium of the Arnold Arboretum. Her capacity as a young systematist is shown in her revision of *Hypoxis* and studies of related genera, published in Rhodora, xxv. nos. 296 and 297 (1923); and her skill as an artist is demonstrated in those papers and in various plates contributed to Rhodora and other botanical journals.

The detailed measurements of the achenes, scales, sheaths, etc., summarized in the present paper, were made by Miss Brackett, but some of the drawings illustrating them were left incompleted. These have been generously put into form for publication by Dr. Henry K. Svenson.

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foundland, but it has gradually broadened to cover all North America. In this work we have depended upon the material in the Gray Herbarium and the herbarium of the New England Botanical Club, supplemented by the very helpful material in the National Herbarium of Canada, loaned by Dr. Malte, the collection (rich in old specimens as well as new) of the Philadelphia Academy, loaned through Dr. Pennell, and specially selected and critical specimens from the New York Botanical Garden, loaned by Dr. Rydberg. To all the gentlemen who have so generously aided us we here express our appreciation and thanks.

As a result of the present study we are recognizing in North America eight species and two varieties which have passed as *Eleocharis palustris*. It has naturally been a problem, what to select as best standing for the Linnean *Scirpus palustris*, since Linnaeus's species was a complex. Long ago *Eleocharis uniglumis*, with the basal glumaceous scale spathiform, was separated off and European botanists have consistently treated *E. palustris* as a plant with 2 or 3 empty basal scales. More recently, Harald Lindberg, Acta Soc. pro Fauna et Fl. Fennica, xxiii. no. 7 (1902), has made a thorough study of the plants of northern Europe and has retained as *Scirpus palustris* the plant with firm subterete culms and elongate tubercles, distinguishing as a new species, *S. mamillatus*, the plant with soft compressed culms and low and broad tubercles and recognizing as a distinct species *S. uniglumis*. In view of this clear differentiation of the three species of northern Europe it is undoubtedly best to accept Lindberg's definition of *Scirpus* or *Eleocharis palustris*, which we have accordingly done. All three of the species of northern Eurasia, *E. palustris*, *E. mamillata* and *E. uniglumis*, are in North America, the first and third crossing the continent, the second (*E. mamillata*) seeming to be inseparable from the plant of the western half of the continent described, one year after *E. mamillata*, as *E. macrostachya* Britton.

In North America the *Palustres* are more complex than in Eurasia. A fourth Asiatic species, *E. kamtschatica*, crosses over to Alaska; another species, wide-ranging in North America, *E. calva* Torr., occurs also in eastern Asia and on the Hawaiian Islands; but the remaining species are, so far as known, strictly North American. One, *E. Smallii* Britton, originally recognized only from the Susquehanna valley, proves to be a widely distributed and highly variable

American species; the other two, here proposed as new, are confined to the region west of the Mississippi, one of them of wide range in the arid region west to Nevada and southward into Mexico, the other as yet known only from a limited area in northern California.

The results of our study are embodied in the following synopsis, with plates illustrating the essential points of the different species and varieties recognized.

a. Basal scales of spikelet usually 2 or 3 below the thinner fertile scales: culms 0.5–5 mm. in diameter (in dried material) at summit of the upper sheath....*b.*

b. Tubercle elongate, much longer than broad: achenes 1.2–2.1 mm. long, narrowly obovoid or pyriform: culms subterete, rather firm.....1. *E. palustris.*

b. Tubercle depressed-deltoid, umbonate or broad-ovate, as broad as or broader than long: achenes 1.2–1.6 mm. long, roundish or broad-obovoid....*c.*

c. Culms firm or wiry, subterete: fertile scales loosely ascending, narrowly ovate to lanceolate, mostly acute or attenuate.....2. *E. Smallii.*

c. Culms soft, flat or compressed: fertile scales appressed, ovate, obtuse or subacute.....3. *E. mamillata.*

a. Basal scales solitary, spathiform, usually completely encircling the base of the spikelet: culms from filiform to 2 (rarely 3) mm. in diameter at summit of the upper sheath....*d.*

d. Culms terete or subterete, scarcely rigid: scales usually purple, reddish or purple-tinged....*e.*

e. Tubercle lanceolate or conical to broadly deltoid or depressed, much shorter than the achene....*f.*

f. Spikelets closely many-flowered: fertile scales often 40 or more, scarious-membranaceous, opaque, commonly brown or rufescent: achenes 1–1.4 mm. long: tubercles 0.2–0.45 mm. broad....*g.*

g. Culms filiform, 0.5–1.5 mm. in diameter: spikelets 0.9–1.7 cm. long: fertile scales oblong to ovate; the lower and median 1.8–3 mm. long.....4. *E. calva.*

g. Culms stout, 1–3 mm. in diameter: spikelets 2–4 cm. long: fertile scales lanceolate; the lower and median 4–5 mm. long.....5. *E. perlonga.*

f. Spikelets loosely few-flowered: fertile scales 5–30, firm-membranaceous to subcoriaceous, commonly lustrous and castaneous or dark-purple; the lower and median 3–5 mm. long: achenes 1.2–1.8 mm. long: tubercle 0.2–1 mm. broad.....6. *E. uniglumis.*

e. Tubercle ovoid, nearly equalling to larger than the achene, spongy and punctate: spikelets castaneous, loosely few-flowered.....7. *E. kamtschatica.*

d. Culms flattened, rigid: scales whitish or stramineous, with brownish stripes.....8. *E. xyridiformis.*

1. E. PALUSTRIS (L.) R. & S. Loosely stoloniferous to subcespitose, commonly (probably always) with widely creeping rootstocks: *culms* commonly terete, rarely a little compressed, *firm but scarcely rigid*, 0.1–1.9 m. high, from nearly filiform to stout, 0.5–5 mm. in diameter at the summit of the upper sheath: sheaths red or brown,

0.2–3 dm. long, rather loose: *spikelet* linear-cylindric to slenderly ovoid, 0.5–2.6 cm. long, 2.5–7 mm. thick, *closely many-flowered: the 2 or 3 basal scales firm,* ovate to oblong, obtuse: *fertile scales* oblong-ovate, *obtuse to subacute,* thin or membranaceous, *reddish-brown,* opaque, with pale scarious margin; the lower and median 3–5.5 mm. long: anthers 1.7–3 mm. long: *achenes obovoid to pyriform,* yellowish to castaneous, *1.2–2.1 mm. long,* 0.8–1.6 mm. broad: *tubercle lanceolate to conic-ovoid or slenderly bulbiform, much higher than broad,* 0.3–0.8 mm. broad at base: perianth of 4 bristles commonly reaching the tubercle, sometimes shorter or wanting. Figs. 1–7.

Represented with us by the two formal varieties:

Culms 1–4 dm. high, 0.5–2 mm. in diameter: lower and median fertile scales 3–4 mm. long: achenes 1.2–1.7 mm. long.....Var. *typica.*
Culms 0.5–1.9 m. high, 1.5–5 mm. in diameter: lower and median fertile scales 3.2–5.5 mm. long: achenes 1.4–2.1 mm. long.....Var. *major.*

Var. typica Rouy, Fl. de Fr. xiii. 361 (1912) as *Heleocharis. Scirpus palustris* L. Sp. Pl. i. 47 (1753). *S. eupaluster* Lindb. fil. Acta Soc. Faun. Fl. Fenn. xxiii. no. 7: 4 (1902). *E.* (as *Heleocharis*) *eupalustris* Lindb. fil. l. c. 5 (1902). *S. palustris, a. typicus* Aschers. & Graebn. Syn. Mitteleur. Fl. ii. Ab. 2: 290 (1903), which see for further synonymy. *Trichophyllum palustre* (L.) Farwell, Rep. Mich. Acad. Sci. xv. 166 (1913).—Culms 1–4 dm. high, 0.5–2 mm. in diameter at summit of the upper sheath: spikelet broad-lanceolate or ovoid, often castaneous, 0.5–2 cm. long, 2.5–6 mm. thick: lower and median fertile scales 3–4 mm. long: anthers 1.7–2 mm. long: achenes 1.2–1.7 mm. long. Figs. 1–4.—Eurasia; and Newfoundland and the Labrador Peninsula to British Columbia, south to northern New England, northern Michigan, North Dakota and along the mountains to Wyoming, Idaho and Oregon. The following are representative American specimens. Newfoundland: pools in limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss,* no. 27,519; in dead water near tide-limit, East Brook, St. Barbe Bay, *Wiegand & Hotchkiss,* no. 27,521; bushy swale on flat north of Doctor Hill, *Fernald & Wiegand,* no. 27,520; shallow pool, Port Saunders, *Fernald, Wiegand & Kittredge,* no. 2702; wet meadow, Pointe Verde, Placentia, *C. S. Williamson,* no. 806. Quebec: Blanc Sablon, July 29, 1915, *C. W. Townsend;* muddy edge of pond, Pointe au Maurier, Charney, *St. John,* no. 90,178; slough in sand-dunes, Natashquan, *St. John,* no. 90,175; open springy places in arbor vitae swamp, New Richmond, August 1, 1904, *Fernald, Collins & Pease;* Little Metis, July 26, 1906, *Fowler;* meadows and swamps south and east of Bic, *Fernald & Collins,* no. 922. New Brunswick: Nepisiguit Grand Falls, *Malte,* no. 119,811; Lac Baker, *W. R. Watson,* no. 119,818. Maine: marly bog, Monticello, *Fernald & Long,* nos. 12,797, 12,798; sandy river-margin, Dover, June 28, 1894, *Fernald;* ditches, North Berwick, June 16, 1894, *Parlin.* New Hampshire: edge of

Fish Pond, Columbia, *Pease*, no. 16,739; Lime Pond, Columbia, *Fernald & Pease*, nos. 16,716, 16,719; sphagnum, Alstead, *Fernald*, no. 257. VERMONT: Willoughby, June 23, 1892, *Kennedy;* miry pool east of Hotel, Willoughby Lake, July 11, 1900, *Brainerd;* shore of Lake Champlain, Highgate Springs, May 28, 1880, *E. S. Hoar.* UNGAVA: Fort George, July 26, 1887, *J. M. Macoun.* ONTARIO: wet places, Blackwater River, Lake Nipigon, July 8, 1884, *J. Macoun;* Lake Superior, July 19, 1869, *J. Macoun.* MICHIGAN: Little Iron River, *Gillman*, no. 50. SASKATCHEWAN: without definite locality, 1858, *Bourgeau;* Spur Creek, *J. Macoun*, no. 16,375; Moose Jaw, *J. Macoun*, no. 16,373. NORTH DAKOTA: wet soil, Leeds, July 2, 1906, *Lunell.* ALBERTA: Jaspar, *Malte*, no. 108,024. IDAHO: wet meadow, Corral, Blaine County, alt. 1740 m., *Macbride & Payson*, no. 3824. WYOMING: meadow, North Pilot Butte, 1878, *C. Richardson;* Black Rock Springs, *A. Nelson*, no. 3725 (as *Carex teretiuscula*). OREGON: near Grizzly Butte Camp, Crook County, alt. 1040 m., *Leiberg*, no. 304; Swan Lake Valley, Klamath County, *Applegate*, no. 768. WASHINGTON: Kittitas County, alt. 600 m., *Sandberg & Leiberg*, no. 705; Grand Coulee, *Griffiths & Cotton*, no. 502; meadow, Granville, *Conard*, no. 352. BRITISH COLUMBIA: Donald, *J. Macoun*, no. 28.

Typical *Eleocharis palustris* (FIGS. 1–4), as shown by the European descriptions and plates, is a low plant, uniformly treated by the recent European botanists as rarely if ever exceeding 4 dm. in height. In Europe the extremely small plants, only 1 dm. or less in height, are sometimes separated as *E. palustris*, var. *arenaria* Sonder and var. *minor* Coss. & Germ. The small plant, which is essentially boreal in America, is often very glaucous and the name *E. palustris*, subvar. *glaucescens* (Willd.) Coss. & Germ. (1845) is often applied to it. Whether this is the true *Scirpus glaucescens* of Willdenow we are unable to determine. As pointed out, in the discussion of *E. uniglumis*, Willdenow's species was said to have flattened culms and 3 style-branches, although Asa Gray and others have identified it with *E. palustris*.

Var. MAJOR Sonder, Fl. Hamb. 22 (1851). *E. palustris*, a *aquatilis* Schur, Enum. Pl. Transs. 690 (1866). *Scirpus palustris*, var. *major* Baumg. acc. to Schur, l. c. (1866). *S. pal.*, forma *Casparyi* Abromeit, Schrift. d. Physik. Oekonom. Gesellsch. Königsb. xxix. 88 (1889). *E. pal.*, var. *vigens* Bailey in Britton, Journ. N. Y. Microsc. Soc. v. 104 (1889). *E. crassa* C. A. Meyer ex Meinsh. Acta Hort. Petrop. xviii. 262 (1901). *S. crassus* C. A. Meyer ex Meinsh. l. c. (1901). *Trichophyllum palustre*, var. *vigens* (Bailey) Farwell, Rep. Mich. Acad. Sci. xxi. 358 (1920). *E. palustris* of most American auth.—Culms 0.5–1.9 m. high, 1.5–5 mm. in diameter at the summit

of the upper sheath: sheaths comparatively loose, 0.3–3 dm. long: spikelet lanceolate to ovoid, 0.7–2.6 cm. long, 2.5–7 mm. thick: lower and median fertile scales 3.2–5.5 mm. long: anthers 1.7–3 mm. long: achenes 1.4–2.1 mm. long, 1–1.6 mm. broad. Figs. 5–7.—Shallow to comparatively deep water of sandy, gravelly or muddy lake- or pond-margins, river-banks or marshy shores, Labrador and Newfoundland to British Columbia, south generally to Pennsylvania, Michigan, Illinois, Iowa, South Dakota, Wyoming, Idaho and northern California. The following, selected from a large representation, are characteristic. Labrador: small lake near mouth of Mulligan River, Lake Melville, *Wetmore*, no. 103,127. Newfoundland: Whitbourne, *Robinson & Schrenk*, no. 121; Tilt Cove, *Fernald, Wiegand & Darlington*, no. 4699; Rushy Pond, *Fernald et al.*, nos. 4697, 4698, 4700; Lookout Mountain, Bonne Bay, *Fernald & Wiegand*, no. 2707; Birchy Cove (Curling), *Fernald & Wiegand*, no. 2703; Sand Bank, west of Burgeo, *Fernald, Long & Fogg*, no. 110. Quebec: Brest, *St. John*, no. 90,176; Natashquan, *Victorin & Rolland*, no. 18,124; Rivière Mingan, *Victorin & Rolland*, no. 25,775; Rivière des Caps, Anticosti, *Victorin & Rolland*, no. 27,513; Rivière Cap Chat, *Fernald & Smith*, no. 25,496; Berthier-en-bas, *Rousseau*, no. 20,163; Lac St.-Jean, *Victorin*, no. 15,114; Black Lake, *Fernald & Jackson*, no. 12,032; Shawinigan Falls, August 1, 1923, *Chamberlain & Knowlton;* Ile Plate, near Montreal, *Victorin*, no. 731; Philipsburg, August 10, 1923, *Knowlton*. Magdalen Islands: Pointe-de-l'Est, Ile de la Grande-Entrée, *Victorin & Rolland*, no. 9352. Prince Edward Island: Lower Sea Cow Pond, *Fernald, Long & St. John*, no. 6953; Victoria Road, *J. Macoun*, no. 32,219. New Brunswick: Bass River, Kent County, 1869, *Fowler;* Woodstock, *Fernald & Long*, no. 12,802; Hampstead, *Fassett*, no. 2187; Hammond, *Svenson & Fassett*, no. 2079. Nova Scotia: Bay St. Lawrence, Cape Breton, August 14, 1904, *Churchill;* South Ingonish, *Nichols*, nos. 698 and 879; Sable Island, *J. Macoun*, nos. 22,648, 77,163, *St. John*, no. 1152; Five-Mile River, *Pease & Long*, no. 20,142; Block House, *Fernald & Long*, no. 23,374; Havelock, *Fernald & Long*, nos. 23,373 and 23,375; Cedar Lake, *Fernald, Bean & White*, no. 20,136; Beaver Lake, *Long & Linder*, nos. 20,134, 20,135; Yarmouth, *Howe & Lang*, no. 160; Salmon Lake, *Fernald, Bissell, Graves, Long & Linder*, no. 20,139. Maine: Pettiquaggamas Lake, *Fernald*, no. 122; Winn, *Fernald & Long*, nos. 12,795, 12,796; Upper Stillwater, July 16, 1892, *Fernald;* Orono, *Fernald & Long*, no. 12,805; Kidney Pond, July 21, 1919, *Graves;* Charlotte, *Fernald*, no. 1383; Rockland, *Fernald*, no. 1389. New Hampshire: Lake Umbagog, Cambridge, *Pease*, no. 16,548; Stewartstown, *Pease*, no. 12,631; Willey Pond, *William Oakes;* Enfield Pond, July 28, 1890, *Kennedy*. Vermont: West Danville, July 13, 1900, *Brainerd;* Franklin, July 16, 1916, *Knowlton;* Colchester, *Blake*, nos. 2100, 2439; Highgate Springs, August, 1873, *Jesup;* South Burlington, August 3, 1921, *Knowlton;* Athens, *Wheeler*.

Massachusetts: Topsfield (as a new but unpublished species), *Chas. Pickering* (herb. Phil. Acad.); Tewksbury, *Pease*, no. 2968; Jamaica Plain, June 28, 1878, *Faxon;* Eastham, *F. S. Collins*, no. 2307; New Marlborough, June 26, 1912, *Hoffmann;* Stockbridge, August 26, 1902, *Hoffmann.* Connecticut: East Hartford, *Driggs*, no. 13; East Lyme, *Graves*, no. 222; Stratford, July 4, 1901, *Harger.* New York: Lake Harris, Essex County, *House*, no. 7349; Clear Lake, Adirondack Lodge, August 30, 1892, *Britton;* Morristown, *Fernald, Wiegand & Eames*, no. 14,186; Lewis Point, Oneida Lake, *House*, no. 14,220; Fisher's Landing, *Robinson & Maxon*, no. 82; Selkirk, *Fernald, Wiegand & Eames*, nos. 14,188, 14,189; Summit Marsh, Spencer, *Eames, Fernald & Wiegand*, no. 14,593; Cortland, *Eames*, no. 5911; Dryden, *Wiegand*, no. 19,424; Buffalo, *G. W. Clinton;* Seaford, Long Island, *Ferguson*, nos. 5605, 5914. New Jersey: Nordhoff, *Dautun*, no. 18. Pennsylvania: Long Pond, Pocono Mts., August 1, 1860, *Porter;* Tinicum, September, 1866, *Porter;* Luzerne County, July, 1896, *S. Brown.* Ungava: Fort George, July 26, 1887, *J. M. Macoun.* Ontario: Wolfe Island, July 8, 1860, *Wm. Boott;* Lake Nipigon, *J. Macoun*, no. 32,208; Port Arthur, July 6, 1888, *B. H. Smith.* Michigan: Sault Ste. Marie, July, 1865, *Porter;* Port Huron, July 9, 1892, *Dodge;* near Lansing, July 28, 1898, *Bailey;* Indian River, August 8, 1890, *C. F. Wheeler;* Keweenaw Co., *Farwell*, nos. 675, 773. Wisconsin: Green Bay, June, 1882, *Schuette;* Western Union Junction, Racine County, *Wadmond*, no. 3144. Illinois: south of Thornton, Cook Co., June 9, 1897, *A. Chase.* Manitoba: Churchill, *J. M. Macoun*, no. 79,220; Grand Beach, Lake Winnipeg, *Malte*, no. 106,701. Iowa: Story City, *Combs & Ball*, no. 439. South Dakota: Aberdeen, *Griffiths*, no. 853. Alberta: Red Deer, *Malte & Watson*, no. 119,810; Vermillion Lakes, *S. Brown*, no. 688. Montana: Big Fork, July 28, 1908, *Clemens.* Wyoming: Fort Bridger, August 6, 1873, *Porter.* Colorado: Parlin, Gunnison Co., August 12, 1901, *B. H. Smith.* Idaho: Lake Tesimini, *Heller*, no. 685; St. Anthony, *Merrill & Wilcox*, no. 793. Utah: in herb. Phil. Acad. on a very mixed sheet occurs a label bearing the numbers 117 and 577, and the localities and dates, "Glenwood and Rabbitt Valley" and "May 27th and Aug. 15th, 1876," *L. F. Ward.* This label accompanies mixed material of *E. calva* and *E. palustris*, var. *major;* the latter is ripe, the former in anthesis. The specimen of *E. palustris*, var. *major* presumably came from Rabbit Valley, Aug. 15th. California: Russian River, north of Cloverdale, July 9, 1902, *Heller*, no. 5828. Oregon: Narrows, *Griffith & Hunter*, no. 247; Juano Valley, *Griffith & Hunter*, no. 366; Chemawan, *Nelson*, no. 1204. Washington: western Klikitat Co., *Suksdorf*, no. 90; Grand Coulee, *Griffith & Cotton*, no. 452; Cow Creek, *Griffith & Cotton*, no. 523; Newport, *Kreager*, no. 453. British Columbia: Victoria Road, Vancouver Island, June 20, 1887, *J. Macoun;* District of Renfrew, *Rosendahl & Brand*, no. 87; Kennedy

Lake, Vancouver I., *J. Macoun*, no. 78,801; Revelstoke, *J. Macoun*, no. 7375; Prince Rupert, *Malte*, no. 119,802.

2. E. Smallii Britton, Torreya, iii. 23, fig. 2 (1903).—Loosely stoloniferous to subcespitose: *culms firm or wiry*, subterete, very slender to rather stout, 0.5–2.5 (except in over-pressed material) mm. in diameter at the summit of the upper sheath, 2.5–9 dm. high: *spikelet* slenderly lance-attenuate to narrowly ellipsoid-ovoid, acute to obtusish, 0.5–2 cm. long, 2.5–5 mm. thick, *loosely-flowered:* the 2 or 3 basal scales narrowly ovate to oblong, obtuse: *fertile scales* in well developed spikelets *loosely ascending, with spreading-ascending tips* (closely imbricated only in poorly developed spikelets); the lower and median lanceolate to narrowly ovate, *acute, often slender-tipped*, 3–5 mm. long, *very thin and scarious*, with 2 purple convergent bands: anthers 1–1.8 mm. long: *achenes rounded-obovoid, 1.2–1.6 mm. long*, 0.8–1.2 mm. broad, yellowish to dark brown: *tubercle broadly ovate, as broad as or broader than long*, often somewhat depressed, about 0.4 mm. broad at base: perianth wanting or more commonly of delicate bristles reaching the tubercle. (Figs. 8–11.)—Peaty and wet sandy swamps, shores and pond- and river-margins, southwestern Nova Scotia to Michigan and Nebraska, south to Delaware, Pennsylvania, Indiana, Illinois and Missouri. The following, selected from a large representation, are characteristic. Nova Scotia: New Germany, *C. A. Hamilton*, in hb. Geol. Surv. Can., no. 80,822. Harper Lake, *Fernald & Long*, no. 23,376; Upper Wood's Harbor, *Fernald & Fassett*, no. 23,540; Salmon Lake, *Fernald, Bissell, Graves, Long & Linder*, nos. 20,140, 20,143; Butler's Lake, Gavelton, *Fernald, Long & Linder*, no. 20,144; Trefry's Lake, Arcadia, *Fernald & Long*, no. 20,170. New Brunswick: Grand Menan, August, 1889, *J. I. Northrop.* Maine: Foxcroft, *Fernald*, no. 302; Fairfield, *Fernald & Long*, no. 12,800; Torrey Pond, Deer Isle, *Hill*, no. 1982; Frankfort, *Fernald & Long*, no. 12,801; Bristol, *Chamberlain*, no. 408; Ocean Point, *Fassett*, nos. 439, 828; Woolwich, *Fernald & Long*, no. 12,806; Green, *Scribner*, no. 104; Wilson's Pond, Cumberland, *Chamberlain*, no. 624; Limington, *Fernald & Long*, no. 12,794. New Hampshire: West Stewartstown, *Fernald & Pease*, no. 16,941; Cherry Pond and Little Cherry Pond, Jefferson, *Pease*, nos. 14,453, 12,921; Alstead, *Fernald*, no. 257. Vermont: Fifield Pond, August 4, 1901, *E. C. Kent;* Spectacle Pond, Wallingford, September 4, 1898, *Eggleston & Ross;* Peacham, June, 1881, *F. Blanchard;* Bowen Pond, Sunderland (alt. 763 m.), *Eggleston*, no. 2133. Massachusetts: Amesbury, 1900, *A. A. Eaton;* Lynnfield, June 17, 1879, *Young;* Swain's Pond, Melrose, June 17, 1879, *Young;* South Framingham, July 21, 1890, *Sturtevant;* Holbrook, June 18, 1899, *Williams;* Cooper's Pond, Carver, *Fernald, Hunnewell & Long*, no. 8888; Weweantet River, Wareham, *Fernald*, no. 820; Freetown, *Sanford*, no. 823; Pocasset, Bourne, *F. S. Collins*, nos. 2621, 2960; No Bottom Pond, Brewster, *Fernald*, no. 18,028; Sparrow Young's Pond, Chatham,

Fernald, no. 16,318; Provincetown, *Fernald & Long*, no. 18,029; Nantucket, July 7, 1885, *Redfield;* Springfield, August 20, 1903, *L. Andrews;* Monterey, July 12, 1912, *R. Hoffmann.* RHODE ISLAND: Cumberland, May 30, 1911, *R. A. Ware;* without statement of locality, *Olney*. CONNECTICUT: Lake Quassapaug, Middlebury, *Blewitt*, no. 1469; Southington, *L. Andrews*, no. 714; Waterbury, *Blewitt*, no. 491. NEW YORK: Lake Ronkonkoma, Long Island, *Ferguson*, nos. 2292, 5037; Big Long Pond, Sag Harbor, Long I., *Ferguson*, no. 5822; Kellis Pond, Bridgehampton, Long I., *Ferguson*, nos. 3930, 4902; Meadowbrook, Long I., *Ferguson*, no. 437; Winfield, Long I., *Ferguson*, no. 4952; New Dorp, Staten I., July 7, 1889, *Britton;* lake above Catskill Mt. House, Catskill Mts., July 15, 1893, *Shear;* Skinner's Creek, Sandy Creek Township, *Fernald, Wiegand & Eames*, no. 14,185. NEW JERSEY: New Egypt Pond, *J. H. Grove*, no. 570½; Manahawken, July 22, 1907, *Long;* Delanco, August 17, 1907, *Van Pelt;* southwest of Clementon, June 12, 1864, *C. E. Smith;* Wildwood, September 10, 1909, *O. H. Brown.* PENNSYLVANIA: Pike Co., July 9–15, 1899, *Brown & Saunders;* Lily Lake, Luzerne Co., August 16, 1889, *Heller, Small;* Mount Bethel, September 2, 1907, *Long;* Rock Hill, June 21, 1908, *Van Pelt;* Byberry, 1866, *Martindale;* Wellsboro, July 7, 1869, *Garber;* Harnsburg, September, 1893, *Small* (TYPE); Safe Harbor, June 23, 1864 (coarse form), July 6, 1866 (slender form), *Porter;* McCall's Ferry, September 26, 1891, *Small* (one of original collections), July 1 and 3, 1904, *Crawford.* DELAWARE: Wilmington, June 25, 1897, *Commons.* MICHIGAN: Jackson, July 15, 1894, *S. H. Camp.* INDIANA: Goose Lake, Whitley Co., *Deam*, no. 31,222; Wahob Lake near Valparaiso, August 16, 1920, *Peattie;* Kankakee River, Thayer, *Deam*, no. 20,128; northwest of Grayville, *Deam*, no. 25,694. WISCONSIN: Sauk Co., 1861, *Hale.* ILLINOIS: near Wady Petra, *V. H. Chase*, nos. 614, 1450; Oquawka, June, 1873, *Patterson.* IOWA: Missouri Valley, *Pammel*, no. 418; Armstrong, June 29, 1897, *Cratty.* MISSOURI: St. Louis, May, 1845, *Engelmann;* Courtney, *Bush*, no. 2997; Webb City, *E. J. Palmer*, no. 2168; near Asbury, *E. J. Palmer*, no. 34,662; Emma, 1897, *Demetrio.* NEBRASKA: Dismal River, south of Thedford, *Rydberg*, no. 1485.

Eleocharis Smallii is quite as common as and often more abundant than *E. palustris* in the silicious and peaty soils of the eastern United States, reaching Canada only in the southwestern corners of Nova Scotia and New Brunswick, where it is associated with other southern species. It varies greatly in size, the coarse plants (FIGS. 8 and 9), such as were originally described by Britton, approaching the larger extremes of *E. palustris*, the slender extremes (FIGS. 10 and 11) being as small as *E. calva.* The culms are more firm and wiry than in our other species (in this character differing from *E. mamil-*

lata of western North America, which has softer and flattened culms but similar, though larger, achenes and tubercles). The fertile scales of the spikelet are remarkably narrow and tapering ordinarily to long acute tips; and most commonly the scales are pale except for the two dark and converging lines. In some extremes, as in the type-material, the spikelet is very slender and with appressed-ascending scales; in the opposite extreme (especially in slender plants) the spikelet is plump and the tips of the scales are free and not appressed. All attempts to separate these two extremes have thus far been futile, although the more slender and lower plants have slightly smaller achenes (Fig. 11).

3. E. MAMILLATA Lindb. fil. Acta Soc. Faun. Fl. Fenn. xxiii. no. 7: 7 (1902) and in Dörfler, Herb. Norm. no. 4383 (1902), as *Heleocharis. Scirpus* (*Heleocharis*) *mamillatus* Lindb. fil. Acta Soc. Faun. Fl. Fenn. xxiii. no. 7: 4, 7, t. I. figs. 1–18 (1902). *E. macrostachya* Britton in Small, Fl. SE. U. S. 184, 1327 (1903).—Resembling *E. palustris;* but with *soft compressed culms* (becoming very flat and ribbon-like under pressure), 0.2–1.2 m. high: *sheaths drab or pale brown*, usually red only at base: spikelets slenderly subcylindric to lanceolate, commonly tapering or acuminate above, 1–3 cm. long, 2–5 mm. thick at base: lower sterile scales 2 or 3, oblong or narrowly ovate: *fertile scales very numerous*, membranaceous, *pale-brown to purplish*, narrowly ovate, obtuse to subacute, appressed; the lower and median 2–4 mm. long: anthers 1.3–2 mm. long: *achene yellowish or pale-brown*, *obovoid*, 1.2–1.6 mm. long: bristles 5 or 6 (rarely 8), very delicate, often overtopping the tubercle, rarely wanting: *tubercle depressed-deltoid or umbonate*, as broad as high, sessile or essentially so. Figs. 27–30.—Marshes, swales, ditches and wet shores, Illinois to British Columbia, south to Louisiana, Texas, Michoacan and southern California; Eurasia. Illinois: Athens, Menard Co., *E. Hall*, as *E. compressa;* Salem, Marion Co., 1860, *Bebb;* St. Clair Co., June 4, 1878, *Eggert.* Missouri: St. Louis, July, 1846, *G. Engelmann*, as *E. compressa;* Buckner, *Bush*, no. 6780; Emma, June 25, 1897, *Demetrio;* Sibley, *Bush*, no. 4011; Kansas City, *Bush*, no. 1748; Prosperity, *E. J. Palmer*, no. 2149. Louisiana: Opelousas, *Carpenter;* "the commonest species in ditches," New Orleans, *Cocks*, no. 1555. North Dakota: Leeds, *Lunell*, no. 7. Nebraska: Red Cloud, *J. M. Bates*, no. 2933. Kansas: Riley Co., *J. B. Norton*, no. 546; Dickinson Co., *Hitchcock*, no. 973, as *E. compressa;* Wichita, *S. F. Poole*, no. 140. Oklahoma: without statement of locality, 1868, *Edw. Palmer* (type of *E. macrostachya*); Kenton, *Stevens*, no. 447. Texas: Terrell, Kaufman Co., May 13, 1904, *F. J. Tyler;* Dallas, *Reverchon*, no. 3600; Devil's River, Valverde Co., July 12, 1849, *C. Wright*, no. 712. Idaho: Falk's Store, Canyon Co., *Mac-*

bride, no. 221. CALIFORNIA: Russian River, Mendocino Co., *Heller*, no. 5828; Shelter Cove, Humboldt Co., *Kellogg & Harford*, no. 1061; Chico, *Copeland*, no. 3182; Calaveras River, *E. E. Stanford*, no. 434; Yosemite Valley, *Abrams*, no. 4632; Santa Barbara, *Rothrock*, no. 155; San Bernardino, *Parish*, nos. 1185, 1186. WASHINGTON: Toppenish, Yakima Co., *Cotton*, no. 788; New London, Chehalis Co., *Lamb*, no. 1201. BRITISH COLUMBIA: Lake House, Skagit River, *J. M. Macoun*, no. 78,193; Depot Creek, Chilliwack Lake, *Spreadborough*, no. 78,192; east of Chilliwack Lake, *J. M. Macoun*, no. 34,773; vicinity of Nanaimo, *J. Macoun*, no. 78,800; Renfrew, *Rosendahl & Butters*, no. 87. DURANGO: vicinity of city of Durango, 1896, *Edw. Palmer*, no. 387. SAN LUIS POTOSI: "in paludosis circa urbem," *Schaffner*, no. 576. MICHOACAN: Rincon, *G. Arsène*, no. 2794, as *E. rostellata*.

Eleocharis mamillata is best distinguished by its very soft and flat or compressed culms and its small achenes with low and broad tubercle. It was presumably included by Linnaeus under his *Scirpus palustris*, but since Lindberg has set off the plant with soft culms and low tubercles, leaving to stand for *E. palustris* the plant with subterete and firmer culms and elongate bulbiform tubercles, it seems wisest to accept this differentiation. As recognized by Lindberg *E. mamillata* was known to be of general dispersal over northern Europe; in the Gray Herbarium it is represented from as far south as Saxony and some Japanese plants (immature) seem to belong to it. In North America the species belongs in the lower altitudes from the Mississippi basin into Mexico and along the Pacific slope north to southern British Columbia. Lindberg's figures of the achenes of the Scandinavian and Finnish plant are perfectly matched by the achenes of American specimens of *E. macrostachya* and authentic specimens of *E. mamillata* (FIGS. 27 and 28) are closely matched by characteristic American sheets (FIGS. 29 and 30) of *E. macrostachya:* the sheet of Lindberg's original distribution, no. 4383 of Dörfler's *Herbarium Normale*, later material collected by Lindberg and distributed as no. 158 in Kneucker's *Cyperaceae et Juncaceae exsiccatae*, as well as Swedish material from Elias Fries and from Hülphers are so close to American specimens that I can find no satisfactory reason to separate the Eurasian and American plants. Some American sheets which are closest matches for European are *Eggert*, St. Clair Co., Illinois; *E. J. Palmer*, no. 2149; *Cocks*, no. 1555; *Stevens*, no. 447; *Lamb*, no. 1201; *J. M. Macoun*, no. 34,773; *J. Macoun*, no. 78,800. These are all plants with dark scales and

full spikelets; but I am unable to get any satisfactory distinctions between these specimens and others from the Mississippi basin westward with more slender spikelets or with paler scales.

4. E. CALVA Torr. Fl. N. Y. ii. 346 (1843). *Scirpus glaucus* Torr. Fl. No. and Mid. U. S. 44 (1824), not *E. glauca* Boeckl. (1871). *E. palustris*, var. *calva* (Torr.) Gray, Man. 522 (1848). *E. palustris*, var. *glaucescens* of many Am. auth., not *Scirpus glaucescens* Willd. (1809). *Trichophyllum palustre*, var. *calvum* (Torr.) Farwell, Rep. Mich. Acad. Sci. xxi. 358 (1920).—Loosely stoloniferous to slightly cespitose, with capillary or slender rhizomes and stolons: *culms* 1–6.5 dm. high, *nearly filiform*, 0.5–1.5 mm. in diameter at the summit of the upper sheath, *terete* or corrugated, rarely compressed: *sheaths red or castaneous, very close;* the upper 0.2–1 dm. long, 0.7–1.5 mm. in diameter: *spikelet* linear-lanceolate or slenderly ovoid, 0.9–1.7 cm. long, 1.5–4 mm. thick, *closely many-flowered: basal scale orbicular to round-ovate, spathiform, completely encircling the bases of the lower fertile scales: fertile scales* oblong to ovate, *mostly obtuse, thin and membranaceous, reddish to pale brown, opaque, closely appressed; the lower and median 1.8–3 mm. long:* anthers 1.3–1.7 mm. long: *achenes* pyriform or narrowly obovoid, yellowish to castaneous, *1–1.4 mm. long*, 0.7–1 mm. broad: *tubercle conical, 0.2–0.45 mm. broad at base:* perianth wanting or of 1–4 delicate bristles usually equaling or slightly exceeding the tubercle. FIGS. 15 and 16.—Wet shores, bogs or springy spots, Quebec to Alberta and Washington, south to Florida, Oklahoma and northern Mexico; also Hawaii and eastern Asia. The following, selected from many specimens, are characteristic. QUEBEC: Rivière Ashuapmouchouan, Baie de St.-Prime, Lac St.-Jean, *Victorin*, no. 15,113; Pointe-Plate, près de Roberval, *Victorin*, no. 15,115; vicinity of Cap a l'Aigle, *J. Macoun*, no. 69,302; Lanoraie, *Svenson & Fassett*, no. 1031; shores of Caughnawaga, *Victorin*, no. 8115; Isle-aux-noix, Richelieu River, *Victorin*, no. 8116; beach of St. Lawrence River, Lachine, August 15, 1912, *Churchill;* Cascades environs d'Ottawa, *Victorin*, no. 10,284; Aylmer, *Malte*, no. 119,807; Caribou Hill, Black Lake, *Fernald & Jackson*, no. 12,031. NEW BRUNSWICK: Tidehead near Campellton, *Malte*, no. 119,813; St. Læonard, *W. R. Watson*, nos. 119,816, 119,817; tidal shores of the St. John, Upper Greenwich and Westfield, *Fassett*, nos. 2190, 2189. NOVA SCOTIA: McDonald's Barren, Northeast Margaree, Cape Breton, *C. B. Robinson*, no. 345. MAINE: Van Buren, September 11, 1896, *Fernald;* Old Town, July 16, 1892, *Fernald;* Orono, July 19, 1890, *Fernald;* Kennebec River, Fairfield, *Fernald & Long*, no. 12,799. NEW HAMPSHIRE: Connecticut River, Northumberland, *Pease*, no. 12,172; Enfield Lake, July 28, 1890, *Kennedy;* Connecticut River, Walpole, July 28, 1901, *Williams*. VERMONT: Knight's Island, Lake Champlain, July 12, 1899, *Brainerd;* L. Champlain, Burlington, *Blake*, no. 2076; Queeche Gulf, Woodstock, July 4, 1910, *Kennedy;*

Salem, July 22, 1914, *Churchill;* Manchester, *Day*, no. 240. MASSACHUSETTS: Glendale, August 10, 1904, *Hoffmann.* CONNECTICUT: Hartford, July 7, 1884, *C. Wright.* NEW YORK: Narrows Island, Black Lake, *Fernald, Wiegand & Eames*, no. 14,184; Blake Lake, Morristown, *Phelps*, no. 180; Sylvan Beach, Oneida Lake, September 4, 1906, *Rowen;* Slayton Pond, Conquest, *Wiegand*, no. 5913; marl ponds, Springport, *Eames*, no. 9332; North Spring, Union Springs, *Wiegand, Fernald & Eames*, no. 14,591; Enfield, *E. L. Palmer*, no. 184. NEW JERSEY: Palisades at Creskill, *Dautun*, no. 17; Milburn, June 24, 1894, *Livingston;* Hewett's Pond, north of Andover, July 2, 1907, *Brown & Van Pelt;* Newton, July 4, 1907, *Carter;* Cold Spring, Cape May County, May 27, 1906, *Van Pelt;* Peermont, Cape May County, June 14, 1908, *Van Pelt.* PENNSYLVANIA: on the Delaware and the Bushkill, Easton, many collections, *Porter;* Mount Bethel, June 28, 1908, *Bartram;* Wilt's Mill meadows along Trout Creek, Allentown, *Pretz*, nos. 485, 4702, 4780; meadow southwest of Trexlertown, *Pretz*, no. 5908; near old Lewis' Furnace, Allentown, July 5, 1912, *Hamm*, no. 1095; Rocky Island in Schuylkill River, West Manayunk, *MacElwee*, no. 556; Green Lane, June 21, 1905, *Van Pelt;* Embreeville, August 9, 1884, *Seal;* West Chester, *Pennell*, no. 372; Susquehanna River, York Furnace, *MacElwee*, no. 225; Safe Harbor, July 6, 1866, *Porter;* Ararat, July, 1900, *Saunders;* Ohio Pyle, *Brown, Crawford & Van Pelt*, no. 52. DELAWARE: Greenbank, August 13, 1879, *Commons.* MARYLAND: river-bed, Conowingo, *Pennell*, no. 1572. VIRGINIA: Wytheville, 1874, *Shriver;* northeast of Williamsburg, *Grimes*, no. 3708. SOUTH CAROLINA: Gough, *J. St. Clair White.* FLORIDA: without locality, *Chapman.* ONTARIO: Moose Factory, James Bay, 1882, *W. Haydon;* Rockliffe, Ottawa, *Malte*, no. 119,803; Port Colborne, *J. Macoun*, no. 34,487; Amer, *J. Macoun*, no. 34,486; Galt, July 15, 1903, *Herriot.* OHIO: Cedar Point, Erie County, June 26, 1897, *Moseley;* Shalersville, Portage County, June 15, 1909, *Webb;* Columbus, 1839, *Sullivant.* INDIANA: Greencastle, June, 1893, *Underwood.* MICHIGAN: Alma, June 23, 1893, *C. A. Davis;* Chatham, 1902, *L. M. Geismar.* WISCONSIN: Oronto, July 30, 1868, *Gilman;* Green Bay, June 22, 1882, *Schuette;* Lake Michigan Beach, Racine, *Wadmond*, no. 3137. ILLINOIS: Stony Island, Cook County, *H. H. Smith*, no. 5931; Illinois River bottom, July and August, 1903 and 1904, *McDonald* (distributed as *E. intermedia*); Urbana, June 27, 1900, *Gleason.* TENNESSEE: along Cumberland River, Nashville, June, 1894, *Bicknell.* MANITOBA: Grand Beach, Lake Winnipeg, *Malte*, nos. 106,697, 106,700; Brandon, *J. Macoun*, no. 16,374. MINNESOTA: Mississippi River, Fort Snelling, *Means*, no. 693. IOWA: Clinton City, *G. D. Butler*, no. 18; Fort Dodge, *M. P. Somes*, no. 111; Iowa City, June 20, 1907, *Somes.* MISSOURI: Webb City, *E. J. Palmer*, no. 2169; London, *Lansing*, no. 2947. ARKANSAS: northwestern Arkansas, *Harvey*, nos. 7 and 36. NORTH DAKOTA: Devil's Lake, 1839, *Nicolet;* wet soil,

Leeds, June 19, 1906, *Lunell;* Butte, July 29, 1906, *Lunell;* Dickinson, August 19, 1908, *Holgate.* South Dakota: Sioux Falls, June 5, 1896, *T. A. Williams;* Lead City, *Rydberg*, no. 1074. Nebraska: low lands of the Missouri, northeastern Nebraska, *F. Clements*, no. 2552; Ashland, *T. A. Williams.* Kansas: Pottawatomie County, *Norton*, no. 547; Cheyenne County, *Hitchcock*, no. 1051a. Oklahoma: Sellard's Pond, near Alva, *Stevens*, no. 251; Beaver County, *Stevens*, no. 372. Saskatchewan: Eagle Creek, *J. Macoun*, no. 73,078; near Prince Albert, *J. Macoun*, no. 16,376. Alberta: Red Deer River, vicinity of Rosedale, *Moodie*, no. 890. Montana: Sin-yale-a-min Lake, *MacDougal*, no. 373; Bozeman, August 23, 1905, *Blankinship.* Wyoming: Laramie, *Nelson*, no. 289; Lower Falls of the Yellowstone, July 26, 1871, *Hayden.* Colorado: Delta, *Tidestrom*, no. 1509; Denver, May, 1881, *B. H. Smith.* Utah: Farmington, June 17, 1908, *Mrs. Joseph Clemens;* Teller's Flat, Fish Lake, *Tidestrom*, no. 1845. Nevada: along ditches, Caliente, *Tidestrom*, no. 9473 as *E. montana.* New Mexico: Santa Fé Creek, *A. A. & E. G. Heller*, no. 3809. Arizona: Camp Grant, alt. 4753 ft., *Rothrock*, no. 380. Mexico: San Luis Potosi, 1878, *Parry & Palmer*, no. 913. Washington: junction of Crab and Wilson Creeks, Douglas County, *Sandberg & Leiberg*, no. 323; Prosser, Yakima County, *Cotton*, no. 660; Grand Coulee, *Griffith & Cotton*, no. 446. Hawaii: Oahu, *U. S. Pac. Expl. Exped.* Eastern Asia: Amur, *Maximowicz;* central Amur, 1891, *Korshnisky;* Amur River, Manchuria, 1855, *Maack*, no. 524.

Eleocharis calva is the inland plant which has usually passed as *E. palustris* var. *glaucescens* or as *E. glaucescens;* but, as explained in the discussion of *E. uniglumis*, *E. glaucescens* rests upon *Scirpus glaucescens* Willd., which is merely a form of *E. palustris.* The only plant besides *E. uniglumis* (Figs. 31 and 17–26) with which *E. calva* (Figs. 15 and 16) is likely to be confused is the most slender extreme of *E. palustris* (Figs. 1–4) but that has 2 or 3 basal scales and much longer, sharper and less appressed fertile ones and larger achenes and long tubercle. The eastern Asiatic specimens cited seem quite like ours but fuller material may show that the two are not identical.

5. **E. perlonga**, n. sp., caespitosa; culmis 1.5–3.5 dm. altis teretibus vel subteretibus 1–3 mm. diametro; vaginis artis 2–5.5 cm. longis 1.5–3.5 mm. diametro ad basin brunnescentibus; spicula linearicylindrica 2.5–4 cm. longa 2.5–5 mm. crassa dense multiflora; squama inferiori spathiformi ovata 2.5–3 mm. longa coriacea; squamis fertilibus membranaceis lanceolatis vel anguste ovatis obtusis vel subacutis, imis mediisque 4–5 mm. longis margine late hyalinis; antheris 2 mm. longis; achaeniis subglobosis vel late obovoideis olivaceobrunneis 1.4 mm. longis 1.1 mm. latis; tuberculo conico ad basin

0.45 mm. lato; setis 2–4 delicatulis tuberculum vix aequantibus. FIGS. 12–14.—CALIFORNIA: Aqua Fria Cañon, Mariposa County, June 20, 1897, *J. W. Congdon*, no. 88 (TYPE in Gray Herb.); vicinity of Ione, Amador County, June, 1904, *E. Braunton*, no. 1058 (herb. N. Y. Bot. Gard.).

Eleocharis perlonga may prove to be an extreme variation of *E. mamillata*, but in its broad and spathiform lower scale it seems to belong to the group with *E. uniglumis*, *E. calva* and *E. xyridiformis*. The material at hand is very inadequate and it is to be hoped that fuller collections can be made.

Another plant of which very inadequate material is at hand is represented only by over-ripe culms (without caudex). This plant (*Burtt Davy*, no. 3288), from wet, adobe meadows, Honey Lake Valley, Lassen County, California, strikingly resembles the most slender extreme (FIGS. 10 and 11) of the eastern *E. Smallii* and its bruised spikelets seem to have 2 or 3 basal sterile scales. Its achenes and tubercles are scarcely separable from those of *E. perlonga*. Fuller and slightly younger material may show it worthy special designation; it is likewise possible that it may be a very slender *E. palustris*, var. *typica*.

6. E. UNIGLUMIS (Link) Schultes, Mant. ii. 88 (1824). *Scirpus uniglumis* Link, Jahrb. d. Gew. i^3: 77 (1820). *Clavula uniglumis* (Link) Dumort. Fl. Belg. 143 (1827). *E. affinis* C. A. Meyer, Beitr. z. Pflanzenk. Russ. Reich. viii. 261 (1851). *E. Watsoni* Bab. Ann. Mag. Nat. Hist. ser. 2, x. 20 (1852). *Scirpus paluster*, subsp. *S. uniglumis* (Link) Aschers. & Graebn. Syn. Mitteleur. Fl. ii. ab. 2: 291 (1904). *S. palustris*, var. *uniglumis* (Link) Junge, Jahrb. Hamburg. Wissenschaftl. Anstalt. xxv. Beih. 3: 248 (1908).—Loosely stoloniferous or cespitose, with the rhizomes and stolons capillary or very slender: *culms* 0.3–7 dm. high, 0.3–3 mm. in diameter at the summit of the upper sheath, *terete* or corrugated, rarely subcompressed: sheaths mostly reddish at least at base, close; the upper 0.8–8.5 cm. long: *spikelets* lanceolate to slenderly ovoid, 0.3–1.7 cm. long, 2–6 mm. thick, *loosely 5–30-flowered: basal scale orbicular or round-ovate, spathiform, completely clasping the base of the spikelet, castaneous*, with pale scarious margin: *fertile scales oblong-ovate, obtuse to subacute, commonly castaneous or purplish, subcoriaceous to firm-membranaceous, lustrous; the lower and median 3–5 mm. long:* anthers 1.5–2.2 mm. long: *achenes* obovoid, pyriform or somewhat ellipsoid, yellowish to dark brown or olive, *1.2–1.8 mm. long*, 1–1.4 mm. broad: tubercle from depressed-deltoid to conic-ovoid or lanceolate, 0.2–1 mm. broad at base: bristles wanting or very delicate and short or sometimes elongate but scarcely overtopping the tubercle. FIGS. 31 and 17–26.

A variable circumpolar species with two somewhat marked varieties with us:

Achenes ellipsoid to narrowly obovoid: the tubercle depressed-deltoid to low-conical, often as broad as high, 0.6–1 mm. broad at base, covering ½–¾ the breadth of the achene.....Var. *typica.*
Achenes broadly obovoid or pyriform: tubercle bulbiform, slenderly conical to lanceolate, commonly higher than broad, 0.2–0.5 mm. broad at base, covering ⅙–rarely ½ the breadth of the achene. .....Var. *halophila.*

Var. **typica.** *Scirpus uniglumis* Link, l. c. (1820). *E. uniglumis* (Link) Schultes, l. c. (1824). Fig. 31.—Basic, calcareous or alkaline shores and marshes, Labrador to British Columbia, south locally along the coast to Rhode Island and inland to North Dakota, Wyoming and Oregon; Greenland and Eurasia. The following American collections are referred here. Labrador: brackish margin of Paradise River, Sandwich Bay, *H. Bishop.* Newfoundland: small pools on diorite tableland, alt. 550 m., Blomidon Mts., *Fernald & Wiegand,* no. 2706. Quebec: brackish shore, Chevalier, *St. John,* no. 90,179; tidal mud at mouth of River Shécatica, Brouague, *St. John,* no. 90,180; estuary of R. Etamaniou, Charnay, *St. John,* no. 90,181; sables près de l'embouchure, R. Romaine, *Victorin & Rolland,* no. 20,165; Murray River, *J. Macoun,* no. 69,301; vicinity of Cap à l'Aigle, *J. Macoun,* no. 69,301. Massachusetts: peaty margin of Sheep Pond, Cuttyhunk, *Fogg,* no. 2526. Rhode Island: damp sandy shore of Wash Pond, Block Island, *Fernald, Hunnewell & Long,* no. 8887. Hudson Bay: without definite statement of locality, *Burke.* Manitoba: boggy place, Brandon, *J. Macoun,* no. 16,374. North Dakota: St. Mary's Lake, *Mabbott,* no. 225. Saskatchewan: Crane Lake, *J. Macoun,* no. 7551, as *E. acuminata;* Long Lake, July 6, 7, 8, 1879, *J. Macoun,* nos. 5, 50, 300; muskeag north of Prince Albert, *J. Macoun,* no. 16,377 in part (as *E. tenuis*). Wyoming: wet alkali soil, Point of Rocks, *Merrill & Wilcox,* no. 708. Oregon: Alkali Lake, Klamath Co., *Applegate,* no. 843; junction of Crab and Wilson's Creeks, Douglas Co., *Sandberg & Leiberg,* no. 323. Washington: Westport, Chehalis Co., *F. H. Lamb,* no. 1103. British Columbia: beach, Alberni Canal, *Rosendahl,* no. 1922; seashore, Point Grey, June, 1898, *R. B. Dixon.*

Var. **halophila,** n. var., achaeniis late obovoideis vel pyriformibus; tuberculo conico vel lanceolato ad basin 0.2–0.5 mm. lato. Figs. 17–26.—Saline and brackish shores, southern Newfoundland and south shore of the St. Lawrence to Delaware; also central New York. The following are typical. Newfoundland: brackish estuary at the Narrows, Port à Port, July 25, 1921, *Mackenzie & Griscom,* no. 10,106; border of brackish pool, Stephenville Crossing, August 14, 1910, *Fernald, Wiegand & Kittredge,* no. 2705; marsh on coast, Bay St. George, August 12, 1908, *Eames & Godfrey,* no. 5884; brackish sand back of Sand Bank, west of Burgeo, September 9,

1926, *Fernald, Long & Fogg*, no. 109. ST. PIERRE ET MIQUELON: marécages, Plaine de Miquelon, 22 juillet, 1901, *Arsène*, no. 86. QUEBEC: brackish shores about mouth of Dartmouth River, August 26 and 27, 1904, *Collins, Fernald & Pease;* platières du delta de la Rivière York, July 16, 1923, *Victorin et al.*, no. 17,060; brackish marshes at mouth of Bonaventure River, August 2–4, 1904, *Collins, Fernald & Pease* (TYPE in Gray Herb.); border of salt marsh, Capucins, July 28, 1922, *Fernald & Pease*, no. 24,914; Anse à Persil, Rivière du Loup, July, 1913, *Victorin*, no. 104. MAGDALEN ISLANDS: wet brackish sand, Étang du Nord, Grindstone Island, July 24, 1912, *Fernald, Bartram, Long & St. John*, no. 6959; sable humide de la dune, Ile du Hâvre-au-Ber, *Victorin & Rolland*, no. 9358; margins of small ponds among the sand hills, Pointe du Loup, July 21, 1912, *Fernald, Bartram, Long & St. John*, no. 6957; étangs sablonneux, Grand Étangs, Ile de la Grande-Entrée, August 1, 1919, *Victorin & Rolland*, no. 9347; étangs sur la dune, Ile Brion, August 4, 1919, *Victorin & Rolland*, no. 9349. PRINCE EDWARD ISLAND: salt marsh, Green's Shore, Summerside, July 21, 1912, *Fernald & St. John*, no. 6955; shore of Cozen's Pond, August 29, 1912, *Fernald, Long & St. John*, no. 6958; boggy ground, Brackley Point, June 28, 1888, *J. Macoun*, no. 32,199; dune-hollows, Brackley Point, August 31, 1912, *Fernald, Long & St. John*, no. 6960. NEW BRUNSWICK: shore of bay, Bathurst, August 16, 1913, *Blake*, no. 5452; salt meadow, Shediac Cape, August 7, 1916, *Hubbard;* brackish meadow, Whitehead Island, Charlotte County, August 5, 1926, *C. A. & U. F. Weatherby*, no. 5501. NOVA SCOTIA: Sable Island, *J. Macoun*, nos. 22,640, 22,647, 77,185–77,187; *St. John*, nos. 1153–1155; damp sand-flats back of beach, Villagedale, August 7, 1920, *Fernald, Long & Linder*, no. 20,147; brackish muddy and gravelly margin of Eel Lake, July 27, 1920, *Fernald, Bean & White*, no. 20,145. MAINE: shallow water between the heath and the salt marsh, base of West Quoddy Head, Lubec, July 26, 1909, *Fernald*, no. 1385; brackish marsh, Baker's Island, July 15, 1898, *Rand;* boggy meadow, Swan's Island Head, Swan's Island, July 22, 1913, *Hill*, no. 735; pool in rocks, Thunder Gulch, Isle au Haut, July 21, 1921, *Kidder;* brookside, Matinicus, July 18, 1921, *C. A. E. Long;* brackish pool, Outer Heron Island, Boothbay, August 30, 1922, *Fassett*, no. 434; among tall grass, Wells Beach, July 23, 1898, *Fernald*. NEW HAMPSHIRE: Hampton Falls, August 11, 1897, *A. A. Eaton*. MASSACHUSETTS: Oak Island, July 9, 1882, *Young;* salt marsh, Neponset River Reservation, June 14, 1920, *Kidder;* salt marsh, Fairhaven, July 15, 1904, *Hervey;* Woods Hole, July 20, 1911, *Pennell*, no. 3009; fresh to brackish springy border of Dinah's Pond, Yarmouth, August 16, 1919, *Fernald & Long*, no. 18,022; salt marsh, Doane Creek, Harwich, July 6, 1918, *Fernald*, no. 16,319; springy border of salt marsh, Red River, Chatham, August 8, 1919, *Fernald & Long*, no. 18,027; sandy shore of Tashmoo Lake, Tisbury, September 5, 1917, *Seymour*, no. 1496;

sandy pond-margin, French Watering Place, Naushon, July 14, 1925, *Fogg*, no. 1028; Madsquecham Pond, Nantucket, September 2, 1904, *Bicknell*. Rhode Island: border of brackish pool, Westerly, August 31, 1919, *Weatherby & Collins;* dune-hollows between Chagum Pond and Wash Pond, Block Island, August 22, 1913, *Fernald, Hunnewell & Long*, no. 8889. Connecticut: salt marsh, Orange, June 20, 1899, *Bissell*. New York: salt marshes, Long Island, *Wm. Darlington;* brackish marsh, Southampton, August 2 and 3, 1920, *St. John*, no. 2598; brackish sandy shore, Great Pond, Montauk, July 7, 1923 and August 8, 1924, *Ferguson*, nos. 2603, 3168; Coney Island, July 4, 1893, *Thos. Seal;* salty spots in meadows northeast of Montezuma Village, Cayuga County, June 25, 1919, *Wiegand, Eames & Randolph*, no. 11,428. New Jersey: shore of Newark Bay, Bergen Point, June 18, 1893, *Thos. Seal;* Deal, August 6, 1866, *A. H. Smith;* Long Beach, June, 1848, *Bischoff;* south of Maxon's Pond, Point Pleasant, July 7, 1910, *Van Pelt & Brown*, no. 277; salt meadows, Atlantic County, July, 1873, *Seal;* Cold Spring, May 27, 1906, *Van Pelt;* marsh toward the Bay shore, Dias Creek, August 11, 1903, *Long*. (The material from Cape May is not quite typical, having unusually depressed tubercles and a tendency toward two instead of a single basal scale, thus approaching *E. Smallii*). Delaware: marshes near Slaughter Beach, July 16, 1896, *Commons;* salt marshes and moist places in sand-dunes, near Cape Henlopen, July 14, 1898, *Commons*.

Eleocharis uniglumis is one of the plants which has been passing in America as *E. palustris*, var. *glaucescens* (Willd.) Gray or as *E. glaucescens* (Willd.) Schultes. The original description of *Scirpus glaucescens* Willd. Enum. Pl. Hort. Berol. 76 (1809) calls for a plant with culms a foot-and-a-half or more in height, the basal sheaths loose, the styles trifid. In studying Willdenow's herbarium Asa Gray made the manuscript memorandum: "*glaucescens!* (spec. cult. but very poor) nothing to do with *S. tenuis*, but certainly *S. palustris!* I wonder Kunth did not find it out. Pretty large and stout, with more slender younger culms, barren intermixed"; and at the same time he noted that *S. uniglumis* "looks good." One of the few old sheets in the Gray Herbarium bears Gray's determination: *E. uniglumis;* this clearly indicating that at first Gray did not consider it identical with *E. glaucescens*, although in several editions of the *Manual* he so treated it. Ascherson & Graebner consider *E. glaucescens* merely a glaucous form of *E. palustris* and Rouy treats it as a glaucescent subvariety of *E. palustris*.

The more northern material, from the Labrador Peninsula, Hudson Bay and westward seems quite inseparable from the Eurasian

plant, with low and broad tubercle (Fig. 31). Southward along the Atlantic coast var. *halophila* (Figs. 17–26) is commonly well defined, so clearly in most cases that we were at first inclined to consider it a distinct species. Too many collections, however, show tubercles in shape inseparable from those of typical *E. uniglumis* but not quite so broad, these collections making a perplexing transition between the two extremes. Some of the collections from southern New England and from Cape May are particularly difficult to place, since their tubercles so strongly approach those of the usually more boreal *E. uniglumis*, var. *typica*. It is possible that they have some admixture of *E. Smallii*, which has low and broad tubercles.

A plant of the Great Plain region, with cespitose habit, rigid culms and pale scales may eventually be separated from *E. uniglumis*. At present the material at hand is too meagre for confident decision.

On account of its single basal glume *Eleocharis calva* (Figs. 15 and 16) might be mistaken for *E. uniglumis*. In general they are quite distinct and *E. calva* occurs in river-silts and other habitats with neutral or slightly calcareous but not strongly alkaline soil; *E. uniglumis* preferring the more concentrated calcareous or alkaline shores.

The range of variation of achenes and tubercles of European *Eleocharis uniglumis*, var. *typica* is well displayed in the study by Harald Lindberg, Acta Soc. Faun. Fl. Fenn. xxiii. no. 7, t. II. figs. 36–56; Dr. Svenson's illustration (Fig. 31) accompanying the present paper shows a characteristic achene. The broadly obovoid achene of var. *halophila* strongly suggests that of the Eurasian and western American *E. mamillata*, but the tubercle of thoroughly characteristic var. *halophila* is more like that of *E. palustris*, mostly longer than broad and varying to lance-ovoid or in extremes to lanceolate and the achene is larger than in *E. mamillata*.

7. E. KAMTSCHATICA (C. A. Meyer) Komarov, Fl. Penins. Kamtsch. i. 207 (1927). *Scirpus kamtschaticus* C. A. Meyer, Mém. Acad. Imp. Sc. St. Pétersb. Div. Sav. i. 198, t. 1 (1831). *E. pileata* Gray, Mem. Am. Acad. n. s. vi. 417 (1859), in part. *S. mitratus* Franch. & Savat. Enum. Pl. Jap. ii. 544 (1879). *? S. sachalinensis* Meinsh. Acta Hort. Petrop. xviii. 260 (1901). *E. Savatieri* Clarke in H. Léveillé, Bull. Acad. de Géog. Bot. xiv. 203 (1904), name only, Kew Bull. Add. Ser. viii. 21 (1908) and Ill. Cyp. t. xxxvi. figs. 15–18 (1909).—Loosely stoloniferous: culms tufted, filiform, 0.3–3 dm. high, 0.5–1 mm. in diameter at summit of the upper sheath, terete: sheaths reddish, close; the upper 0.6–8 cm. long: *spikelet* oblong-lanceolate, 4–12 mm. long, 2.5–5 mm. broad, *loosely few-flowered:*

basal scale broadly ovate, completely encircling the bases of the flowering scales, castaneous, with pale scarious margin: *fertile scales* 10–20, broadly ovate, *rounded at tip, castaneous, subcoriaceous; the lower and median about 3 mm. long:* anthers 1.7–2 mm. long: achenes obovoid, 1.3–1.5 mm. long, 1.2 mm. broad, closely capped by the *high narrowly ovoid* spongy-cellular *mitriform blunt tubercle (nearly as long as to longer than the achene)*: perianth wanting or of 3–6 delicate bristles, sometimes slightly exceeding the achene. Figs. 32 and 33.—Eastern Asia and southern Alaska. The following have been examined from Alaska: mud flats by small lakes near Yes Bay, *Howell*, nos. 1685, 1686; in beaver ponds, Yes Bay, *Gorman*, no. 158. Hultén cites material from Unalashka.

Meyer's *Scirpus kamtschaticus* was based on flowering material, but Hultén, Fl. Kamtch. and Adj. Isl. i. 166 (1927), definitely identifies it with the plant of eastern Asia and Alaska with "stylopodium . . nearly as big as the achenes" and he further places with it *E. triflora* Komarov in Fedde, Rep. Spec. Nov. xiii. 162 (1914), which he says is merely a small extreme of *E. kamtschatica.* The original sheet in the Gray Herbarium of *E. pileata* Gray is a hopeless mixture: the plants partly *E. palustris* (L.) R. & S., partly *E. japonica* Miquel; but the achenes, specially separated out and preserved in a pocket, are those clearly described by Gray in his account of *E. pileata.* These are quite like those of Howell's Alaskan material (Figs. 32 and 33) which was cited by Clarke as his *E. Savatieri* and they agree perfectly with Clarke's illustration of the latter; they are, likewise, like Hultén's account of the achene and tubercle of *E. kamtschatica.* The description of *Scirpus sachalinensis* Meinsh. is so very similar that we felt little hesitation in placing that species also with *E. kamtschatica.*

8. **E. xyridiformis**, n. sp., rigida; rhizomate nigro indurato; culmis rigidis pallidis 1–5.5 dm. longis valde compressis corrugatisque saepe tortis plerumque in caespitibus parvis remotisque; vaginis artis basi rufescentibus, supremis griseis 1.5–7 cm. longis 1–2 mm. diametro: spicula anguste lanceolata 1–2 cm. longa 2–3.5 mm. crassa dense multiflora; squama inferiori spathiformi orbiculata coriacea straminea 1.5–2.5 mm. diametro margine hyalina; squamis fertilibus ellipticis vel ovatis obtusis vel apice rotundatis subcoriaceis stramineis vel albescentibus brunneo-striatis margine albido-hyalinis, imis mediisque 2–3 mm. longis; antheris 2–2.5 mm. longis; setis 2–6 (vel 0) tuberculo superantibus vel vix aequantibus saepe brevissimis vel nullis; achaeniis obovoideis stramineis deinde subcastaneis 1.2–1.8 mm. longis 1–1.4 mm. latis; tuberculo albido deltoideo vel ovato 0.3–0.5 mm. longo 0.3–0.7 mm. lato. Figs. 34 and 35.—North-

central Kansas to Nevada, south to the states of Mexico and Jalisco. KANSAS: moist places near Osborne City, May 12, 1894, *Shear*, no. 27. TEXAS: prairies of the Piedra Pinta, Kinney Co., July 3, 1849, *C. Wright*, no. 710. NEW MEXICO: without indication of locality, 1851–52, *Wright*. NEVADA: Muddy River, St. Thomas, 1877, *E. Palmer*, no. 467. ARIZONA: vicinity of Flagstaff, July 12, 1898, *MacDougal*, no. 270; Moenkopi Wash, Painted Desert, July, 1920, *Clute*, no. 125; Spatterbone Lake, Mohave Co., May 15, 1903, *C. F. Wheeler*. DURANGO: vicinity of city of Durango, 1896, *E. Palmer*, no. 187. QUERETARO: Queretaro, 1912, *Frère Basile*, no. 191. MEXICO: Valley of Mexico, May 7, 1898, *Pringle*, no. 6817 (TYPE in Gray Herb.). JALISCO: marshes of the Rio Grande de Santiago near Atequiza, May 20, 1890, *Pringle*, no. 3125.

Eleocharis xyridiformis, on account of its flattened culms, is likely to be confused with *E. mamillata* (FIGS. 27–30), which, like *E. xyridiformis*, is characteristic of the region west of the Mississippi and southward into Mexico. Its very rigid culms ordinarily distinguish *E. xyridiformis*, for the culms of *E. mamillata* are soft and unresistant. In most well developed spikelets the basal scale of *E. xyridiformis* is clearly spathiform, though there is a slight departure from this character; and in *E. mamillata* the basal scales are usually 2 or 3, though rarely only one. In the latter species the spikelet is commonly longer, with merely obtuse or subacute purple-tinged membranaceous fertile scales; in *E. xyridiformis* the shorter spikelets have more rounded and paler scales. The achenes of *E. mamillata* are usually yellowish and the tubercle more depressed, the achene of *E. xyridiformis* quickly becoming dark-brown. Judging from the range, *E. xyridiformis* occurs in more alkaline habitats than *E. mamillata* and its habit suggests a strong xerophytic tendency.

EXPLANATION OF PLATES 181 TO 184.

(Habit × ½; spikelets × 5; achenes, except figs. 22–26, × 20.)

Figs. 1–4, *Eleocharis palustris*, var. *typica;* 5–7, *E. palustris*, var. *major;* 8 and 9, *E. Smallii*, coarse extreme; 10 and 11, *E. Smallii*, slender extreme; 12–14, *E. perlonga*, from type specimen; 15 and 16, *E. calva;* 17–26, *E. uniglumis*, var. *halophila;* 27 and 28, *E. mamillata*, from type-collection, *Lindberg fil.* in Dörfler Herb. Norm., no. 4383; 29 and 30, *E. mamillata* (*E. macrostachya*) from Salem, Illinois, *Bebb;* 31, *E. uniglumis* from Bavaria; 32, 32a and 33, *E. kamtschatica* from Alaska; 34 and 35, *E. xyridiformis*, from type-specimen.

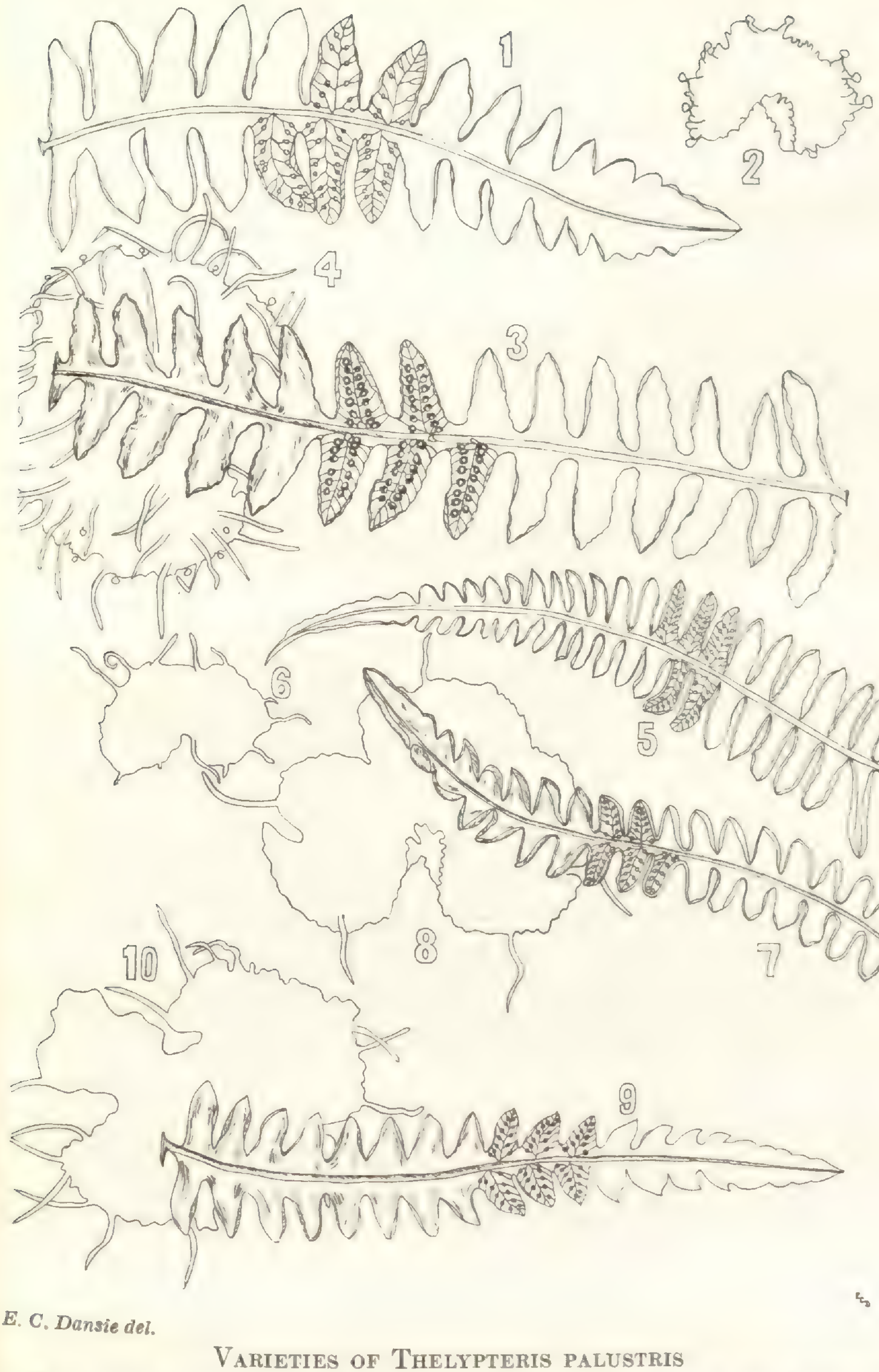
V. A NOTE ON POA LABRADORICA.

M. L. Fernald.

On page 44 I described as a new species, *Poa labradorica*, a characteristic grass of eastern Labrador, distinguished from *P. eminens* Presl by its narrower and greener leaves, stricter panicle, 2–3-flowered spikelets glabrous throughout (except for pilosity at the base of the lemma), and narrower and more acute glumes. I am chagrined to find that I overlooked *P. labradorica* Steudel, Syn. Pl. Gram. 252 (1854), which is undoubtedly the same as my own *P. labradorica*. Steudel's description emphasizes the same characters; and I am informed by Professor Hitchcock that: "Mrs. Chase examined the type [Steudel's] at Paris. It was collected by Albrecht. Her notes state that it is *Poa eminens* or a closely allied species."

In view of Steudel's description of the plant, with "foliis . . . 2″ longis, 1–2‴ latis . . . ; paniculae elongatae contractae strictae (4–6-pollicaris) radiis erectis subadpressis . . . glabris; spiculis . . . glabris . . . 2–3-floris; glumis inaequalibus altera spiculas fere superante acutata, altera breviore acutiuscula; valvula . . . glabra," there seems to be no question that *Poa labradorica* Fernald (1929) is P. LABRADORICA Steudel (1854).

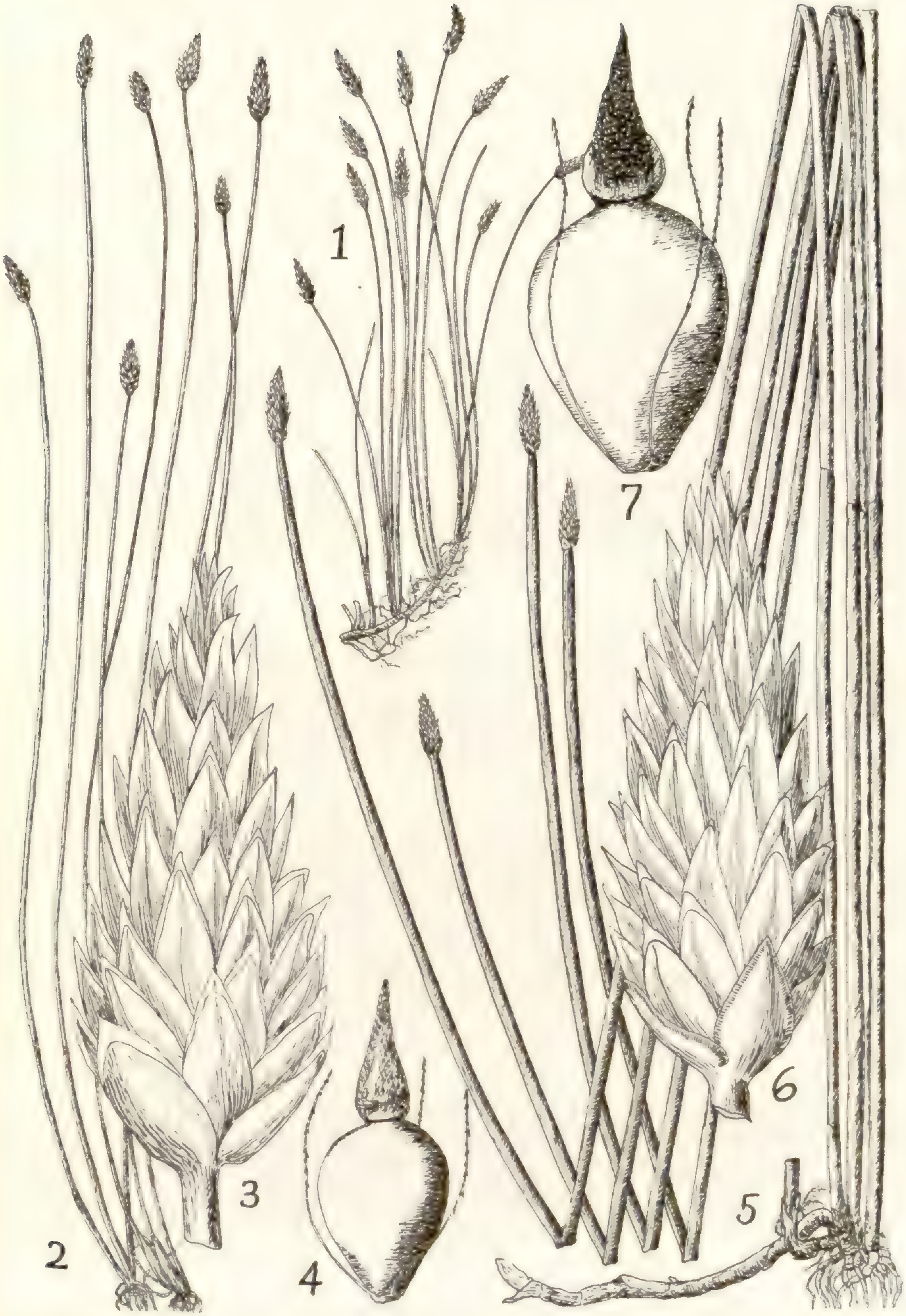
SCHMIDEL'S DETAILS OF THELYPTERIS



E. C. Dansie del.

Varieties of Thelypteris palustris

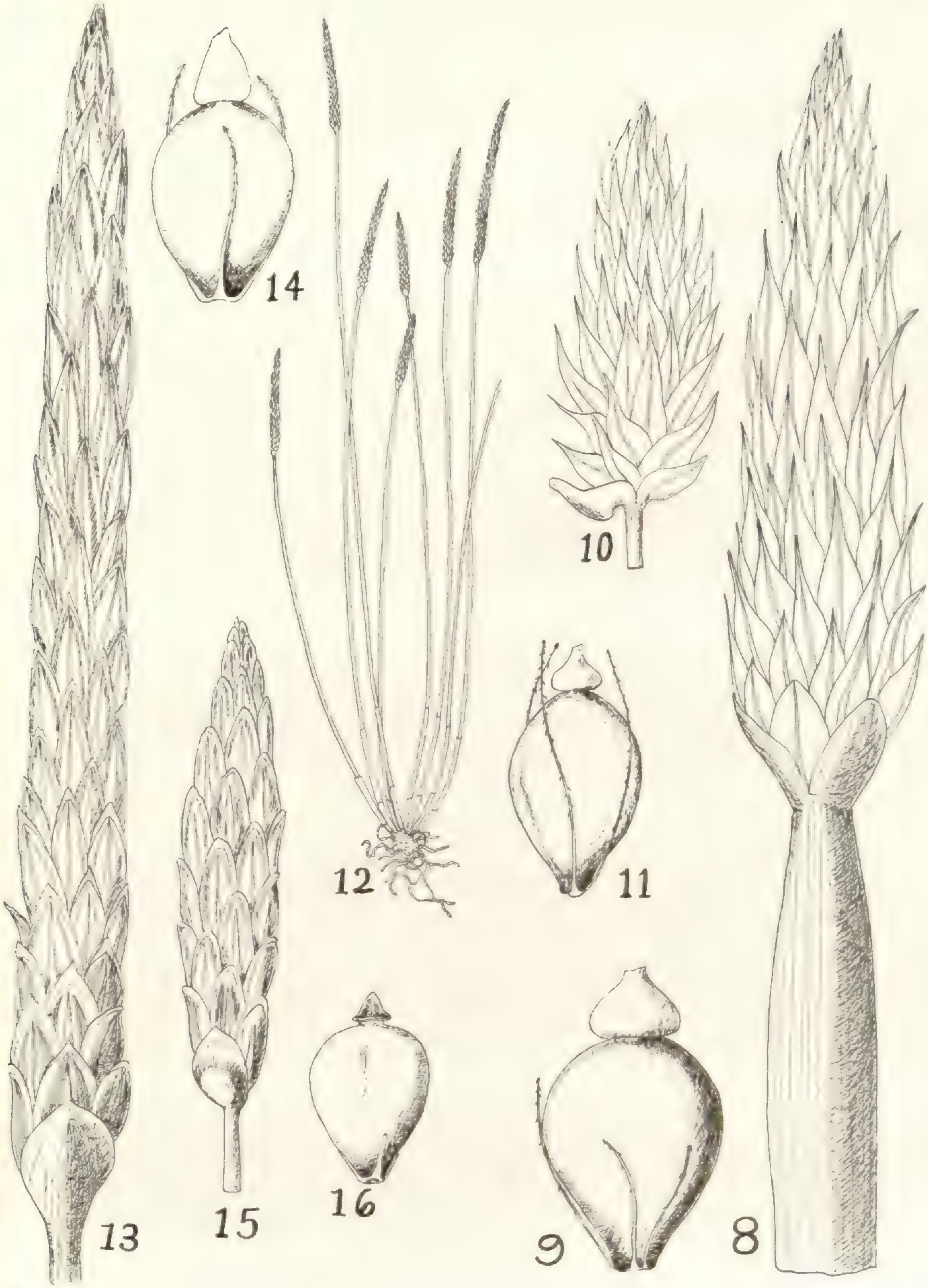
Figs. 1 and 2, var. typica; 3 and 4, var. squamigera; 5 and 6, var. Haleana; 7–10, var. pubescens.



A. E. Brackett del.

ELEOCHARIS PALUSTRIS

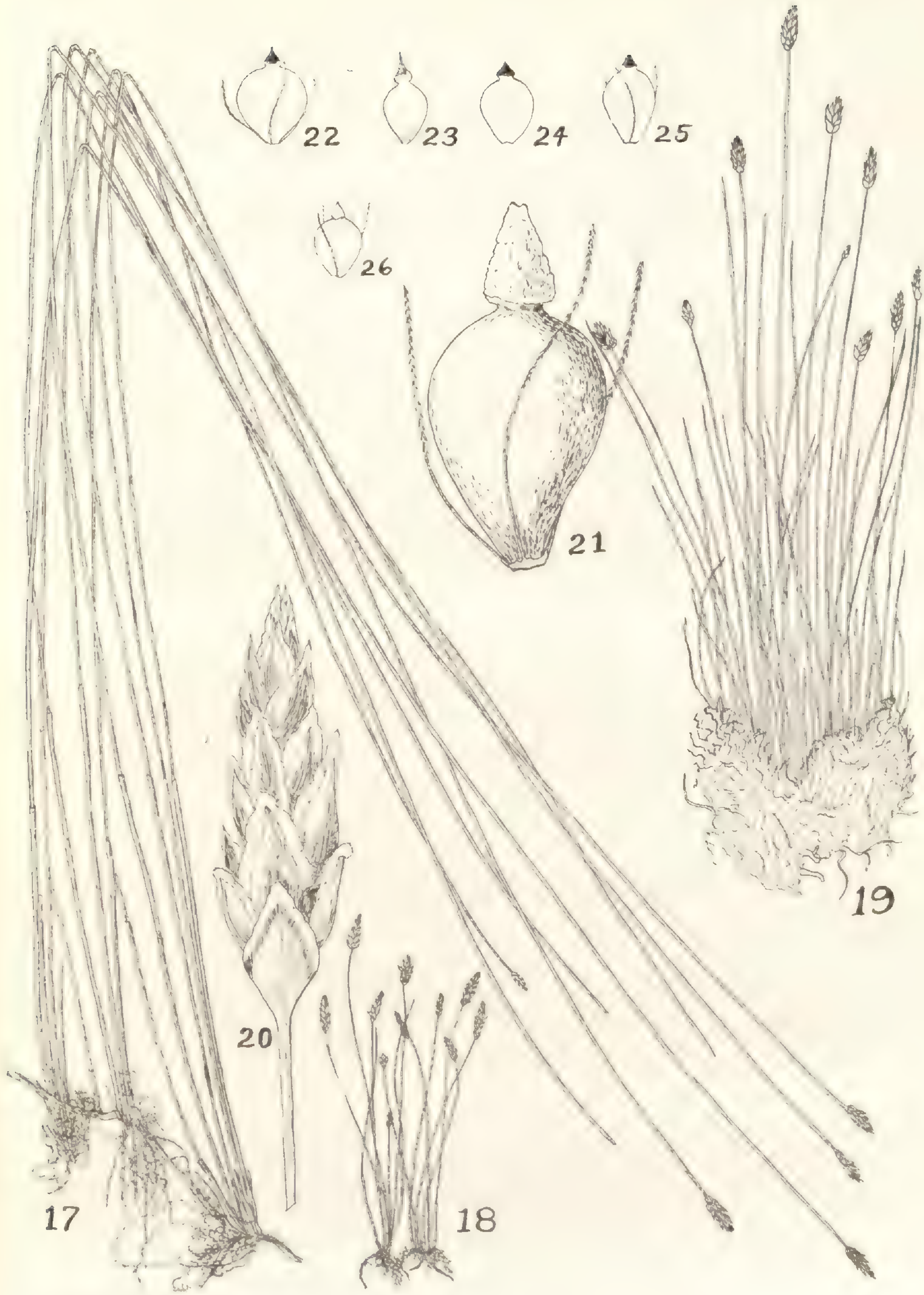
FIGS. 1–4, var. TYPICA; 5–7, var. MAJOR.



A. E. Brackett and H. K. Svenson del.

ELEOCHARIS

FIGS. 8–11, E. SMALLII; 12–14, E. PERLONGA; 15 and 16. E. CALVA.



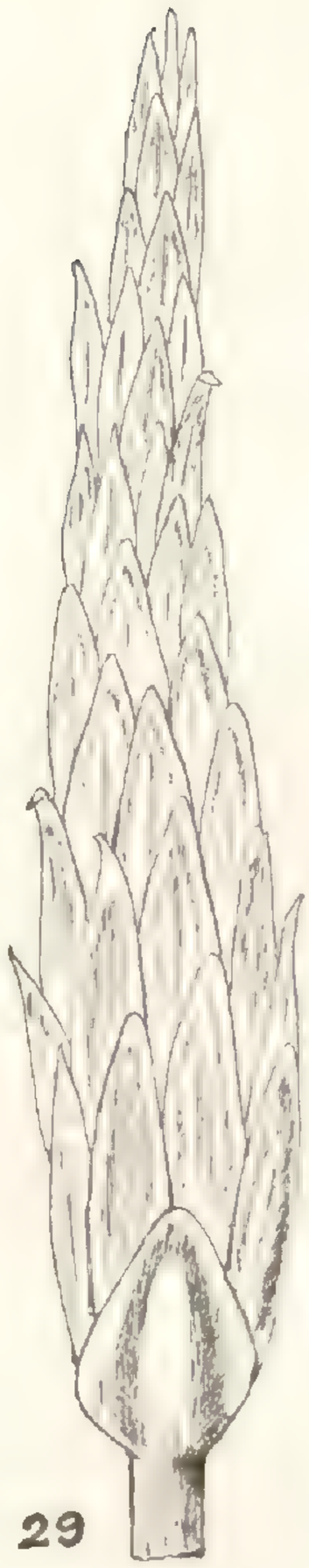
A. E. Brackett del.

ELEOCHARIS UNIGLUMIS, VAR. HALOPHILA

27

28

30



29

31

34

32

32a

33

35

H. K. Svenson del.

ELEOCHARIS

FIGS. 27–30, E. MAMILLATA; 31, E. UNIGLUMIS; 32 and 33, E. KAMTSCHATICA; 34 and 35, E. XYRIDIFORMIS.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
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LXXXIV

A TENTATIVE REVISION OF ALCHEMILLA § LACHEMILLA

By Lily M. Perry

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A TENTATIVE REVISION OF ALCHEMILLA § LACHEMILLA

LILY M. PERRY

INTRODUCTION

THE species of *Alchemilla* ranging in the high mountains from Mexico to Argentina constitute within the genus a well marked group which Focke designated as the section *Lachemilla*. Although Weddell revised the South American species of the section in 1861 and Rydberg reviewed the North American species in 1908, no one has published a detailed treatment of the group as a whole. The collections of *Lachemilla* accumulated in the different herbaria have been in great confusion, containing much unidentified and incorrectly named material. A detailed study of the entire section was therefore undertaken in order that more critical determinations could be made and the existing confusion of identities untangled. The writer herewith presents the results in an endeavor to state more clearly the specific concepts as well as to assemble and to present in a natural order all the known species of the group.

During the year 1781 the younger Linnaeus, Suppl. 129, described *A. aphanoides*, the first species of the section *Lachemilla*. Seventeen years later Ruiz & Pavon, Fl. Peruv. i. 68 (1798), published three more species which in 1805 Persoon, Syn. Pl. i. 150, transferred to the genus *Aphanes*. In 1825 De Candolle, Prodromus ii. 590, gave a short summary of nine species belonging to the group, a complete record at that date. The outstanding worker on the section is Weddell, Chloris Andina ii. 244-249, who in 1861 produced the most comprehensive treatment of the Andean members of the genus *Alchemilla*. The work, however, embraces less than half of the species and varieties known at the present time. During the year 1888 Focke in a study of the *Rosaceae*, E. & P. Nat. Pflanzenf. iii. Abt. 3, 43, divided the genus *Alchemilla* into three sections as follows: *Eualchemilla* embracing the European, African and northern North American species; *Aphanes* containing the more or less cosmopolitan annuals; and *Lachemilla* including the high montane perennials of Central and South America. Six years later Lagerheim, Kongl. Svenska Vetenskaps-Akademiens Forhandl. i. 15-18 (1894), having devoted some time to a study of the South American material, pointed out that the stamens of *Lachemilla* are attached to the inner rim of the disk and that the anthers dehisce extrorsely. In these regards the section differs from *Eualchemilla* in which the stamens are located at

the outer edge of the disk and have introrse anthers. Lagerheim maintained, therefore, that the section *Lachemilla* was coördinate with a supergroup including both *Eualchemilla* and *Aphanes*, and that it merited the rank of subgenus. Lagerheim further argued that the subgenus *Lachemilla* contained two sections and accordingly established *Eulachemilla* and *Fockella*, the former section characterized by the presence of an epicalyx and the latter by the lack of it. In 1908 Rydberg, North Amer. Fl. xxii. 377-385, published a revision of the *Rosaceae* in which he expanded the genus *Alchemilla* into a tribe comprised of four genera: *Alchemilla*, *Aphanes*, *Lachemilla* and *Zygalchemilla*. Of these only *Lachemilla* and *Zygalchemilla* belong in the section here discussed. Fedde, Bot. Jahresb. xxxvi. pt. 2, 496 (1910), however, transferred the names of Rydberg's new species to the genus *Alchemilla* of other authors. But Dammer, in Fedde, Rep. Spec. Nov. xv. 362-365 (1918), following Rydberg's work, published seven species under the generic name *Lachemilla*. During the year 1915 Murbeck called attention to the likeness in staminal characters between *Lachemilla* and *Aphanes* and as a result of his observations merged these groups and rearranged the sections of the genus *Alchemilla* limiting them to *Eualchemilla*, *Aphanes* and *Fockella*. The writer treats the section *Lachemilla* in its broadest sense, including therein Lagerheim's section *Fockella* and Rydberg's genera, *Lachemilla* and *Zygalchemilla*. This is in agreement with the concept of the section as originally defined by Focke.

In regard to the relation of *Lachemilla* and *Aphanes*, it must be remembered that the two sections differ not only in habit but also in habitat and in distribution. The first group are perennials, inhabitants of high altitudes and isolated in range, while the second are annuals prevailingly of low levels and nearly cosmopolitan in geographic scope. In view of these obvious differences, although there is a likeness in the staminal features of the sections in question, it seems best for practical reasons to keep them separate.

Lagerheim's section *Fockella* is a little more perplexing. The lack of an epicalyx (the bractlets of the hypanthium) is a very notable feature and has been used as a sectional character. Nevertheless, a critical study of the three species without bractlets, *A. Mandoniana*, *A. diplophylla* and *A. Rusbyi*, does not reveal any similarity of characters indicative of their immediate relation. On the other hand, *A. Mandoniana* both in habit and in foliar features closely allies itself with the series *Pinnatae*. Moreover, in the *Aphanoides*, one collection of *A. frigida* shows a very definite tendency towards the loss of bractlets, some flowers are typical in bearing four bractlets, others have

three, two or often only one. A survey of the section as a whole has led the writer to believe that the absence of an epicalyx does not indicate a separate trend in the phylogeny of *Alchemilla*, but is rather an example of parallel development within the various series.

Discussion of Groups

In the course of the present study it has become increasingly evident to the writer that no clear or satisfactory group-classification within the section *Lachemilla* can be based upon floral characters, for the flower-structure remains too constant throughout. It is in the foliar characters, if at all, that one must seek differences sufficiently conspicuous and definite for the purpose.

The series *Polylepides* and the series *Diplophyllae* are both to our present knowledge monotypic groups possibly representing the two extremes in the development of the section *Lachemilla*. *A. Polylepis*, on the one hand, is a very low shrub, without known immediate relatives, it lacks highly specialized structures and is restricted in range—facts pretty clearly suggesting that it is a relic. Thus in *Lachemilla* the woody-stemmed species appear more primitive than the herbaceous. On the other hand, *A. diplophylla*, a little herb first associated with *Alchemilla* by Weddell, is characterized by its conspicuously appendaged leaves, lack of bractlets and peculiar bracteoliferous peduncles. These are eminently distinctive traits indicating a highly modified condition, and fully justifying the assumption that this species is the most specialized in the section.

The remaining series, the *Orbiculatae*, *Aphanoides*, *Nivales* and *Pinnatae* have without doubt a common origin, since they intergrade to such a degree that the lines of division are somewhat arbitrary. Consequently, the arrangement of the series in this paper is merely an attempt to classify them according to the extent of their interrelation and their modification from the ancestral type, wherever possible keeping closely related subgroups and species adjacent to one another.

The *Orbiculatae*, as here interpreted, include six species with palmately lobed or cleft leaves and with flowers disposed in profuse terminal cymes. This series is most nearly related to the *Aphanoides* and occupies the same general range.

The *Aphanoides* contain twenty-one species divisible into six subseries. Of these the one regarded as the most primitive is composed of three species, *A. procumbens*, *A. vulcanica* and *A. Jamesonii*, distinguished from all others by the pubescent inner surface of the hypanthium. The four species, *A. Williamsii*, *A. frigida*, *A. ranunculoides* and *A. Grisebachiana*, by their prostrate habit call to mind the *Orbi-*

culatae, although they lack the open floral arrangement and have definitely tripartite leaves. The individual flowers of *A. Williamsii* are much like those of *A. orbiculata;* but the remaining three species, though very closely resembling *A. Williamsii* in habit, have much smaller and glabrous flowers. The next subseries includes the most variable and intergrading species of the section (Nos. 15-22). Their habit is decumbent or ascending. The inflorescence is both axillary and terminal with transitional stages, and in certain species there is manifest a very definite tendency to develop sharply pointed achenes. Another more or less vacillating feature is the cleaving of the lateral foliar lobes. Although the inconstancy of the characters indicates that these species are in process of active evolution, no marked departure from the features of the series is in evidence. The two following subseries (Nos. 23-27), however, exemplify transitional states to the *Nivales* and the *Pinnatae*. In the first, the blades of the middle stem-leaves are not conspicuously longer than the stipular lobes, while those of the upper leaves are adnate to the stipules forming sheaths with ascending equal segments not unlike those of the *Nivales*. Here belong *A. Sprucei*, *A. Purdiei* and *A. holosericea*. The second containing only two species, *A. sandiensis* and *A. repens*, is distinguished by subpinnately tripartite basal leaves. In general aspect and texture *A. sandiensis* appears to be sufficiently like *A. Mandoniana* to suggest a distant relation between the two, and the basal leaves of *A. repens* call to mind those of *A. erodiifolia*. The creeping habit of these species is quite similar to that of the *Pinnatae*. *A. Rusbyi* is an anomalous species with flowers closely resembling those of *A. Mandoniana* and stem-leaves somewhat imitative of the foliar condition of the *Nivales*, but the long internodes, the tripartite basal leaves and the general habit are characters which indicate its relation to the series *Aphanoides*.

Although both the *Nivales* and the *Pinnatae* are believed to be evolved from the *Aphanoides*, the *Nivales* exemplify the more direct transition. The foliar sheaths are the conspicuous feature of the group. These are apparently highly modified leaf-blades and stipules simulating a whorl of simple elongate leaves. Other features characteristic of the series are the reduction and the early disappearance of the basal leaves, and the tendency of the hypanthium-lobes to be slightly thickened at the tips. Curiously enough in this group and in the *Pinnatae* the hypanthium is often glabrous while the hypanthium-lobes are still pubescent; on the contrary in the *Aphanoides*, the glabrate quality of the flowers is first manifested in the hypanthium-lobes.

The series *Pinnatae* is composed of several fairly clear-cut species. Its distribution covers a larger geographical range than that of any other group. It is readily distinguished by the pinnate or bipinnatifid basal leaves, the lack of diffused branching and the reduced inflorescence. The one striking exception is *A. bipinnatifida* which is diffusely branched and has an inflorescence similar in type to that of the *Aphanoides*. It probably is a transitional form. The remaining species of the *Pinnatae* have the flowers solitary and axillary on very short branches or in terminal glomerules. The change in the mode of foliar division and the simple type of inflorescence suggest a more modified form than that of any of the preceding closely allied series.

Gross Morphology

Roots.—The root-systems in most of the herbaceous species are not extensive and are usually short-lived. Secondary roots developing annually from nodes and branches resting on the moist surface of the ground serve as sources of nourishment and support for the plant, so that life is carried over from year to year. In *A. orbiculata* and nearly related forms, however, the roots are long and spread near the surface of the ground.

Stems.—Although it is possible that none of the stems lack ligneous tissue, only one species, *A. Polylepis*, has woody stems; these are 4–6 (–10) mm. in diameter. They are profusely branched and crooked in the manner frequent in stunted shrubs. The remaining species have slender (only 1–2 mm. thick) herbaceous more or less branching stems, being subacaulescent or rising to 2.5 dm. in height, and varying in position from erect to prostrate. Ordinarily the stems of the *Nivales* appear stout on account of the imbrication and perhaps at times a slight inflation of the leaf-sheaths. It seems probable that such a species as *A. nivalis* with an upright cespitose habit might maintain itself by creeping rootstocks, but none of the collections examined for this work shows these. In *A. diplophylla*, however, the rhizome is an obvious feature. It should also be noted that members of the *Aphanoides* with somewhat ascending habit are characterized by numerous creeping more or less subterranean stems which die away at one end as the new growth develops at the other.

Leaves.—The leaf-characters, while not adequately constant to separate species without the correlation of other features, do indicate fairly definite group-relations. The segmentation of the blade varies from shallowly lobed to pinnately parted. The texture ordinarily is firm, in some species slightly thicker than in others and is occasionally even coriaceous. One modification of the leaf-blade deserving

special mention is found in *A. diplophylla*. Here attached along the midrib of the upper surface are two foliaceous appendages sufficiently developed to cover almost the entire expanse of the blade. It is Murbeck's theory that the ancestral form was a 5-lobed leaf in which the two outer lobes and the middle lobe grew together or fused under the alternate (second and fourth) lobes and finally made these alternate lobes appear as appendages on the upper surface of the leaf. Another conspicuous foliar modification is illustrated in the leaf-sheaths of the *Nivales*. In this instance the transition from the normal type of leaves is much more apparent than in *A. diplophylla*. The leaf-segments have grown smaller as the stipular divisions have enlarged until the result is a sheath with lobes commonly equal, entire and revolute-margined. The stipules of the basal leaves are ordinarily membranaceous, golden-brown, obliquely lanceolate to ovate and acute, adnate to the petioles but not connate. On the other hand, the stipules of the stem-leaves are connate (either amplexicaul or vaginant) and adnate to the petioles or the sessile leaf-blades. In texture and in pubescence the stipules closely resemble the leaves except in *A. erodiifolia*, *A. barbata* and *A. rupestris* where they are usually golden-brown and predominantly membranaceous. Another species with distinctive stipules is *A. Polylepis* in which the commonly free stipular lobes are united in front of the leaf-blade.

Pubescence.—The quantity of pubescence is exceedingly variable within a species, probably on account of differences in altitude, habitat and seasonal growth. The trichomes, which in a few species spring from bulbous bases, are all simple and vary in length, rigidity, coarseness and direction. One of the difficulties in this study has been to choose consistently descriptive terms applicable to the pubescence of each particular species. In order to aid the reader in the precise interpretation of the descriptions contained in this paper, it seems necessary to define the following terms which have been applied to the pubescence. Sericeous: clothed with closely appressed pubescence; villous: bearing abundant fine long spreading or somewhat appressed hairs; pilose: similar to the preceding but having shorter and less abundant hairs; hirsute: pubescent with long moderately distinct hairs and here implying only slight coarseness; hispidulous: beset with short relatively coarse stiff hairs or minute bristles. These terms are merely relative and in using them it should be remembered that even the coarsest pubescence in the section *Lachemilla* is fine.

Inflorescence.—Although the inflorescence of the *Orbiculatae* and of certain species of the *Aphanoides* appears loosely dichotomous or

openly racemose, the floral arrangement of the section *Lachemilla* is characteristically cymose and predominantly glomerulate. In the *Pinnatae* the inflorescence is more or less reduced, the flowers being in glomerules at the tips of the stems and short lateral branches or solitary in the axils of the leaves. Apart from the general arrangement, especial attention is called to the scapose peduncle characteristic of *A. orbiculata* and the bracteoliferous peduncle not less noteworthy in *A. diplophylla;* both forms are singular in the section.

Calyx.—In contour the hypanthium or cup-like portion of the calyx varies from turbinate to urceolate. The outer surface may be pubescent, glabrate or glabrous; but the inner except at the throat is glabrous in all but three species, *A. procumbens*, *A. vulcanica* and *A. Jamesonii*. These have the hypanthium pubescent within. Whether this is the expression of a relatively recent adaptation to some ecological condition or whether it is a primitive trait may only be surmised. Since, however, relatively youthful forms in process of active evolution are exceedingly variable, one point of evidence in favor of the latter view is found in the constancy of the three species mentioned. It perhaps should also be noted that, in other species, there is often associated with the achene-attachment a tuft of hairs which might be regarded as the relic of this pubescence. The throat of the hypanthium is more or less constricted by a slightly pulvinate annular disk, which is subtended by a variable amount of pubescence. In glabrous flowers the trichomes of the throat, though always present, are sparse; in pubescent flowers, however, they are always abundant. They are particularly conspicuous in the mature flowers of *A. Williamsii* where they protrude through the orifice of the disk, and in floral dissections they are densely tufted immediately below the bases of the filaments. Ordinarily the hypanthium has eight ribs; occasionally, however, only four are found. This lack is probably owing to a more or less pronounced reduction of the bractlets, at any rate the two tendencies are closely associated in the flowers examined. The hypanthium-lobes are arranged in two series, the sepals and the bractlets. The latter apparently are lacking in the material examined of *A. Mandoniana*, *A. Rusbyi* and *A. diplophylla*. Professor Diels, however, observed that rudiments are present in the type of *A. Mandoniana* at Paris. One collection included in *A. frigida* illustrates very well the variability in the development of the epicalyx; some flowers are normal bearing four bractlets, others have three or two or sometimes only one. Although no other collections indicated so definite a trend towards the reduction of the bractlets, floral dissections of various species revealed a tendency for the bract-

lets to become smaller or irregular in conjunction with the reduction or the disappearance of the fibro-vascular bundles in the hypanthia. This feature would be solved better by a detailed morphological study. Entirely apart from the discussion of bractlets, a curious but perhaps insignificant feature of the *Nivales* is the tendency of the hypanthium-lobes to become thickened at the apices.

STAMENS.—The stamens are inserted on the inner rim of the disk directly in front of the sepals. Ordinarily each flower has two, but often in members of the series *Orbiculatae* three, or rarely four, occur in some flowers. In *A. Williamsii* and in *A. Sprucei*, however, the predominant number is four, although this might not hold if one could examine several collections of these species. The filaments are glabrous and short being ordinarily not more than half the length of the sepals. The anthers are somewhat reniform and confluent, at maturity opening extrorsely by a transverse slit. Throughout the section the stamens are strikingly uniform and apparently lacking in specific characters.

ACHENES.—The achenes are always included in the persistent calyx. They vary from 1–6(–10) and are usually stipitate. It would seem as if the variation in color, size and contour of the achenes ought to reveal specific relations but the writer has been unable to discover in them constant features even for group-entities. The series *Aphanoides* shows the widest range in variability. The large obtuse achenes of *A. procumbens*, *A. vulcanica* and *A. Jamesonii* are much like those of *A. orbiculata* and are in marked contrast to the smaller sharply pointed ones of *A. Pringlei*, *A. velutina* and *A. Standleyi*. Those of the remaining species of the *Aphanoides* fall between these extremes. The achenes of the *Nivales* are smaller than those of any other group and almost round at the apex. The styles are basal, ventral, ascending and persistent. This is the major character of the genus. The capitate stigmas vary from subglobose to clavate. This difference of form furnishes their only really constant trait of specific value.

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questions which developed during this study. To all who have made these loans possible the writer expresses her hearty appreciation for the favors given. She especially thanks Dr. I. M. Johnston who has given very freely both assistance and constructive criticism.

Taxonomic Treatment

Alchemilla § Lachemilla Focke. Perennials: stems prostrate, decumbent or erect, pubescent or glabrous: basal and lower leaves petiolate, palmately or pinnately lobed, cleft or parted; upper leaves similar but smaller and commonly sessile; stipules of the cauline leaves usually foliaceous, lobed or cleft, connate, adnate to the petiole or the sessile leaf-blade, the whole appearing as a multifid perfoliate leaf or a many-lobed sheath: inflorescence of small axillary or terminal cymes usually glomerulate more rarely loose and racemosely disposed or the flowers at times solitary; hypanthium persistent, turbinate to campanulate or urceolate, at maturity usually constricted at the throat; lobes 4–8(–10), bractlets 0–4(–7) subtending 4(–5) sepals: petals none: stamens (1–)2(–4) borne on the inner edge of the more or less pulvinate disk and opposite the sepals; filaments short, usually not more than half the length of the sepals; anthers extrorse, opening by a transverse slit: achenes 1–10, included in the hypanthium, more or less stipitate; styles basal; stigmas capitate, subglobose or clavate. —Focke in E. & P. Nat. Pflanzenf. iii. Abt. 3, 43 (1888). *Aphanes* Pers. Syn. Pl. i. 150 (1805) in part. *Alchemilla* subg. *Lachemilla* Lagerheim, Kongl. Svenska Vetenskaps-Akademiens Forhandl. i. 16 (1894) including both § *Eulachemilla* Lagerheim l. c. 16, 17 and § *Fockella* Lagerheim l. c. *Lachemilla* Rydb. North Amer. Fl. xxii 380 (1908). *Zygalchemilla* Rydb. l. c. 385.

Key to Groups

Shrubs 3 dm. or less high: stipular lobes connate in front of the leaf-blade . . . . . Ser. I. Polylepides
Herbs: stipular lobes not connate in front of the leaf-blade
  Leaf-blades without appendages
    Leaves palmately lobed, cleft or parted
      Basal leaves 5–11-lobed or -cleft . . . . . Ser. II. Orbiculatae
      Basal leaves 3–5-cleft or -parted
        Stem-leaves tripartite . . . . . Ser. III. Aphanoides
        Stem-leaves reduced, with the adnate stipules forming verticillate sheaths . . . . . Ser. IV. Nivales
    Leaves pinnately cleft or parted . . . . . Ser. V. Pinnatae
  Leaf-blades bearing appendages on the upper surface. Ser. VI. Diplophyllae

Series I. **Polylepides.** Low shrubs profusely branching: leaves sessile: stipular lobes connate in front of the leaf-blade. Species 1.

1. **A. Polylepis** Wedd. A depressed compact profusely branched shrub 3 dm. or less high: stems with bark exfoliating and somewhat shredded: branches clothed with imbricated scale-like marcescent stipular sheaths; new growth leafy: leaves cuneate to obovate, densely sericeous-villous, plicate, 3–7-lobed or deeply incised-dentate (with lobes or teeth entire and acute), sessile, apparently springing from well below the summit of the vaginant stipules: stipules of the vegetative shoots imbricate, often ciliate, golden-brown, cartilaginous, the free portions almost completely connate in front of the leaf-blade, sparsely villous becoming densely so on the three nerves marking the morphological petiole and on the two nerves rising to the tips of the stipules; stipules of the floral shoots similar but neither imbricated nor united above the attachment of the leaf-blade: inflorescence a terminal diffuse panicle of small cymes: flowers in dense glomerules, very short-pedicelled, sericeous: hypanthium turbinate, 2.5–3 mm. long; lobes greenish-yellow to yellow; bractlets linear-lanceolate and variable in size; sepals broadly ovate, short-acuminate, 1.5–1.75 mm. long: achene 1; stigma capitate and unusually large.—Chloris Andina ii. 246, Pl. 75 A (1861). *Lachemilla columbiana* Dammer in Fedde, Rep. Spec. Nov. xv. 364 (1918).—Columbia and Venezuela.

COLOMBIA: Paramo de Mucuchio, *Moritz 1117* (G, phot. of ISOTYPE of *L. columbiana* at Brit. Mus.); Paramo de Santurban, Sept. 1825, *Purdie* (K); near Vetas, Paramo de Santurban, 3950–4160 m. alt., *Killip & Smith 17,511* and *17,561* (G); near Vetas, Paramo Frailejonale, Dept. Santander, 3750–3850 m. alt., *Killip & Smith 17,976* (G); Nevada de Santa Marta, 3900 m. alt., June, 1844, *Purdie* (K).

VENEZUELA: Paramo de Timotes, State of Tachira, 3000–3500 m. alt., March, 1910, *Jahn 56* (US); Paramo de Ste. Domingo, Mérida, 3600 m. alt., Sept. 1922, *Jahn 1104* (US).

Apart from the shrubby habit this species possesses other quite distinctive characters. The older twigs are covered with slightly shredded or flaked bark, while the branchlets are fuscous and roughened by the imbricated remnants of the villous stipular sheaths. In the latter feature, this species resembles the genus *Polylepis*. The leaves are unique in the section *Lachemilla;* the blades are sessile and apparently attached much below the top of the stipular sheath. The only conspicuous floral character is the unusually large capitate stigma; the anthers tend to be smaller than ordinary; and the hypanthium is 4- or 8-ribbed according to the development of the bractlets.

Series II. **Orbiculatae.** Herbs with repent or decumbent stems: leaves palmately 5–11-lobed or -cleft: flowers disposed in racemose-cymes: achenes 1–1.5 mm. long; styles commonly much exserted; stigmas subclavate. Species 2–7.

Key to Species

Stolons with greatly reduced or scale-like leaves: inflorescence springing from the basal rosette: floral bracts conspicuously sheathing ..... 2. *A. orbiculata*

Stolons leafy: inflorescence axillary or terminal on leafy shoots: floral bracts amplexicaul but not sheathing

Leaf-blades shallowly 5–11-lobed: stipules of the basal leaves entire; those of the upper leaves incised-dentate or -lobed with the teeth or lobes commonly not spreading nor recurved

Basal leaves 9–11-lobed, deeply cordate, slightly coriaceous: flowers sericeous, large (4 mm. long): hypanthium but slightly constricted at the throat ..... 3. *A. pectinata*

Basal leaves 5–7-lobed, obscurely if at all cordate, not coriaceous: flowers dull, appressed-pubescent, smaller (2.5–3 mm. long): hypanthium conspicuously constricted at the throat ..... 4. *A. Lechleriana*

Leaf-blades palmately 5–9-cleft: stipules of the basal leaves entire or incised-dentate; those of the upper leaves multifid with lobes spreading or recurved

Teeth of leaf-lobes obtusish: hypanthium elongate-turbinate, at least twice as long as its lobes: achenes with rounded apices, very long-stipitate; stigmas clavate. 5. *A. sarmentosa*

Teeth of leaf-lobes acutish: hypanthium usually not twice as long as its lobes: achenes with somewhat pointed apices, stipitate; stigmas subclavate

Hypanthium sericeous, globose-urceolate with erect to subconnivent lobes ..... 6. *A. pascuorum*

Hypanthium villous, turbinate-urceolate with erect to spreading lobes ..... 7. *A. venusta*

2. **A. orbiculata** R. & P. A stoloniferous perennial: stolons with greatly reduced or scale-like leaves, the axils always giving rise to offsets: basal leaves orbicular-reniform 1.5–2.5 cm. broad, somewhat plicate, thickish, not coriaceous, obscurely 9–11-lobed, deeply cordate with the sinus open or closed, incised-serrate, glabrate above, beneath villous and slightly sericeous except between the ribs where glabrate and at times somewhat glaucous; petioles 3–10(–24) cm. long, villous; stipules membranaceous, light brown, functioning as bud-scales: floral shoots springing from basal rosettes, with leaves greatly reduced if at all present: inflorescence dichotomous, loosely corymbose: floral bracts multifid, vaginant, concealing the pedicel and at times the lower part of the hypanthium: flowers large, 3–4 mm. long, sericeous-villous: hypanthium ca. 2.5 mm. long, urceolate-campanulate; lobes ca. 1.5 mm. long, spreading, apex within occasionally pilose or barbate; bractlets narrowly ovate equalling or slightly shorter than the broadly ovate sepals; annular disk thickish nearly filling the throat: carpels 2; achenes 2 or 1; stigma subclavate.—Fl. Peruv. i. 68 (1798); Wedd. Chloris Andina ii. 244 (1861). *Aphanes orbiculata* Pers. Syn. Pl. i. 150 (1805). *Lachemilla orbiculata* Rydb. North Amer. Fl. xxii. 381 (1908).—Colombia to Peru.

COLOMBIA: Paramo de Las Puentes, above La Baja, Dept. Santander, 3500–3700 m. alt., *Killip & Smith 18,226* (G); vicinity of Vetas, Dept. Santander, 3100–3250 m. alt., *Killip & Smith 17,913* (G); Paramo Rico, near Vetas, Dept. Santander, 3750–3850 m. alt., *Killip & Smith 17,671* (G); Paramo de Mogotocoro, near Vetas, 3700–3800 m. alt., *Killip & Smith 17,649* (G); Paramo de Las Coloradas, above La Baja, Dept. Santander, 3900–4100 m. alt., *Killip & Smith 18,409* (G); Paramo de Las Vegas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 15,662* (G); Facatativá, Dept. Cundinamarca, ca. 2630 m. alt., *André 616* (K, NY); Paramo de Bogotá, *Ariste-Joseph A89* (US), *Triana* (K); "Pinares" above Salento, Dept. Caldas, 2700–2900 m. alt., *Pennell 9407* (G, NY); "Rosalito" near Paramo de Ruiz, Dept. Tolima, 2800–3100 m. alt., *Pennell 2972* (G, NY, US); Las Escaleretas, Moras Valley, Rio Paez basin, Dept. Cauca, 2500–3000 m. alt., *Pittier 1345* (US); Popayan, 1800–3000 m. alt., *Lehmann B.T. 713* (K, NY); Tuquerres, *Triana 4203* in part (K).

ECUADOR: wooded hills ca. 8 km. south of Tulcan, 2500 m. alt., *Hitchcock 20,976* (G, NY, US); Pichincha, *Jameson 66* (K); region San Ignacio, Pichincha, ca. 3400 m. alt., *Anthony & Tate 151* (US); Quito, 2700–3300 m. alt., *Hall* (K); Quito, *Rose & Rose 23,538* (G, NY, US); Andes of Quito, *Jameson 697* (K); Quitensian Andes, 1855, *Couthouy* (G); Corazón, 3990 m. alt., *André K. 500* (K); Urbina, ca. 3400 m. alt., *Anthony & Tate 363* (US); Urbina, *Rose, Pachano & Rose 23,940* (US); Paramo on the east flank of Mt. Chimborazo, Urbina, 3600 m. alt., *Hitchcock 22,023* (G, US); Chimborazo, 3300 m. alt., *Lehmann 391a* (K, US); in grassy places, Mt. Guayrapata, *Spruce ?4979* (K); in mountain pastures especially along streams, Baños, Aug. 1857, *Spruce 4979* (K); in the Andes of Ecuador, 1857-9, *Spruce 4979* (K); vicinity of Nabón, *Rose, Pachano & Rose 23,000* (G, NY, US).

PERU: hills, Huanuco, ca. 3000–3500 m. alt., April, 1866, *Pearce 66* (K); 24 km. southeast of Huanuco, ca. 3150 m. alt., *Macbride & Featherstone 2088* (F, US); Mito, ca. 2700 m. alt., *Macbride & Featherstone 1439* (F, US); Paltarum, *Mathews 811* (K); Pinasiocj, Panticalla Pass, ca. 3600 m. alt., *Cook & Gilbert 1817* and *1855* (US).

The outstanding features of this species are the reduced leaves of the stolons, the development of offsets in the axils of the leaves, and an essentially leafless inflorescence. In field notes collectors indicate its compact habit by use of such words or phrases as "mats," "cushions," or "hanging in cushions on level ground." The density of growth is due to the profusion of leaves and flowers characteristic of the individual plant, the persistence of the stolons and their short internodes; these assume a woody or rhizomatous appearance and serve as connecting links in the colony of plants. A variety differing from the typical only in its widely-spreading villosity appears in Colombia:

Var. **villifera**, var. nov., stolonibus et petiolis cum pilis longis gracilibus patentissimis instructis.

COLOMBIA: "Canaan," Mt. Purace, 2600–3000 m. alt., *Pennell & Killip 6801* (G, TYPE; US), 3100–3300 m. alt., *Pennell & Killip 6586* (G, US); Tuquerres, 3000 m. alt., *Triana 4203* in part (K).

3. **A. pectinata** HBK. A stoloniferous perennial: primary branches flagelliform, leafy axils giving rise to floral shoots or offsets: basal and lower stem-leaves orbicular-reniform, 1.5–4 cm. broad, slightly coria-

ceous, shallowly 9–11-lobed, deeply cordate, pectinate-serrate, green and glabrate above, beneath sericeous or silvery, glabrate at times between the ribs; petioles 3–6(–20) cm. long, sericeous; stipules membranaceous, large, light brown, functioning as bud-scales: upper leaves with short petioles (2.5–1 cm. long) or subsessile, decreasing in size and usually 5–3-lobed; stipules connate and adnate to the petioles forming a somewhat tubular sheath, leaf-like in texture, deeply incised-dentate or -lobed, the teeth or lobes not spreading nor recurving: inflorescence racemose, axillary or terminal: flowers large, 3.5–4 mm. long, densely sericeous: floral bracts amplexicaul, not sheathing: hypanthium turbinate-campanulate; lobes 8(–10), spreading, ovate-oblong to ovate, acute, bractlets equalling or slightly narrower than the sepals; annular disk almost filling the throat: carpels 4–6; achenes 2–4; stigmas subclavate.—Nov. Gen. et Spec. vi. 226 (1824); DC. Prodr. ii. 590 (1825). *A. ciliata* Willd. ex Steud. Nom. Bot. ed 2, i. 47, 48 (1840). *Lachemilla orbiculata* Rydb. North Amer. Fl. xxii. 381 (1908).—Mexico to Bolivia.

Mexico: Cuyamecalco, Cuicatlan, Oaxaca, *Conzatti 2425* (US); Cumlue Huehuetlan, Feotitlán, Oaxaca, *Conzatti 4120* (US).

Guatemala: Volcán Tajumulco, 3000 m. alt., *Shannon 323* (US); Volcán de Agua, 3000–3300 m. alt., *Maxon & Hay 3723* (US).

Costa Rica: Cerro de las Vueltas, San José, 2700–3000 m. alt., *Standley & Valerio 43,629* and *43,667* (US); southern slope of Volcán de Turrialba, near the Finca del Volcán de Turrialba, 2000–2400 m. alt., *Standley 35,002* and *35,265* (US).

Colombia: Antioquia, 2640 m. alt., 1880, *Kalbreyer 1486* (K); Bogotá, *Ariste-Joseph A901* (US), 3000 m. alt., 1851-7, *Triana 4202* (K, NY), ca. 3400 m. alt., *Dawe 110* (K).

Bolivia: Unduavi, 3200 m. alt., Feb. 12, 1907, *Buchtien 637* (US), Feb. 1914, *Buchtien 458* (G, US), 3000 m. alt., *Rusby 475* (G, US), Dec. 1865 *Pearce* (K).

Of the collections cited the following are atypical in the characters mentioned: *Maxon & Hay 3723* has an unusually vigorous growth of the main stem (commonly 1–3 cm. long, here 13 cm.). Standley's *35,002* and *35,265* are singular in the densely silky lower surface of the leaves. *Ariste-Joseph A901* and *Kalbreyer 1486* have leaves with exceedingly long petioles and erect rather than decumbent branches; although technically they are nearer *A. pectinata*, in general appearance they closely resemble *A. orbiculata*, and their occurrence in a region where both species are found might suggest that they were of hybrid origin. A form much more constant than the typical and differing from it only in pubescence is

Var. **mexicana**, var. nov., caulibus et petiolis patenter villosis.—Central and southern Mexico with one collection from Guatemala and one from Colombia.

MEXICO: Jalapa, Vera Cruz, *Schiede* (G), *Rose & Hough 4268* in part (G, US); Barranca of Texolo, Vera Cruz, 1050 m. alt., *Pringle 7996* (G, US); Orizaba, *Bourgeau 2505* (G), *Botteri 172* (G, US), *Nelson 215* (US); Hidalgo, *Caec. & Ed. Seler 874* (G, US); Trinidad Iron Works, Hidalgo, ca. 2100 m. alt., *Pringle 13,520* in part (US); Boca del Monte, Puebla, 2300 m. alt., *Arsène 2139* (G, US); west slope of Mt. Zempoaltepec, Oaxaca, 2310–2400 m. alt., *Nelson 561* (US); near Reyes, Oaxaca, 2250–3120 m. alt., *Nelson 1752* (US); Sierra de Reyes, Oaxaca, 2400–2700 m. alt., *Pringle 6039* (G, US); Chiapas, *Ghiesbreght 613* (G, TYPE), *Caec. & Ed. Seler 2166* (G).

GUATEMALA: between Tactic and Coban, Dept. Alta Verapaz, 2000 m. alt., *von Tuerckheim II 1621* in part (US).

COLOMBIA: Quebrada de Pais, north of La Baja, Dept. Santander, ca. 3200 m. alt., *Killip & Smith 18,805* (G).

Kunth after describing *A. pectinata* noted that it was very closely related to *A. orbiculata*, and since Weddell's publication it has been a general practice to treat the two as one species. Although their geographical ranges overlap in Colombia, and the collections of *Kalbreyer 1486* and of *Ariste-Joseph 1901* suggest that there is probably some hybridization between them in this region, nevertheless in comparison with the other members of this group *A. pectinata* surely merits specific rank. The following is a brief summary contrasting the conspicuous features of the two species:

In *A. pectinata* the stolons have well-developed leaves from the axils of which offsets or floral shoots may rise; the inflorescence also is leafy and the bracts subtending the individual flowers are amplexicaul, usually exposing both pedicel and flower, while a floral dissection reveals 4–6 carpels.

On the other hand, in *A. orbiculata* the stolons have greatly reduced or scale-like leaves from the axils of which only offsets develop; the inflorescence is essentially leafless, the bracts subtending the flowers are vaginant, concealing the pedicel and often a portion of the hypanthium, and very rarely are there more than 2 carpels.

4. **A. Lechleriana** Griseb. A stoloniferous perennial: stolons with well-developed leaves, the axils giving rise to floral shoots or offsets: basal and lower stem-leaves orbicular, 1.5–2 cm. broad, somewhat plicate, 5–7-lobed with sinuses very narrow and obscure; lobes obtusish-angled rather than rounded, incised-serrate with acute teeth, appressed-pilose above, beneath densely appressed-villous and slightly sericeous; petioles 3.5 cm. long or less, somewhat sericeous-villous; stipules of the basal leaves lance-ovate, entire, membranaceous, villous: upper leaves small (0.5–1 cm. broad), usually trilobed with short petioles or subsessile; stipules connate, tubular, adnate to the petiole, incised-dentate: inflorescence loosely racemose, axillary and terminal: floral bracts amplexicaul: flowers 2.5–3 mm. long, appressed-pubescent, not sericeous: pedicels 1–1.5 mm. long: hypanthium turbi-

nate-urceolate, throat much constricted; lobes 1 mm. long, acute; the bractlets linear-lanceolate, the sepals oblong-lanceolate: carpels 2 or 3; achenes usually 2; stigmas subclavate.—Goett. Abh. xxiv. [Symb. Flor. Argent.] 124 (1879). *? A. orbiculata* β. Wedd. Chloris Andina ii. 244 (1861).

PERU: Sachapata, Aug. 1854, *Lechler 2606* (K).

The general habit of this plant is very like that of *A. pectinata.* On close observation, however, one finds the leaves more nearly orbicular than reniform, the sinus at the insertion of the petiole broad and open, rather than deeply cordate, and the lobes slightly angular; the flowers are much narrower as well as a little shorter with the constriction of the throat more marked, they have also a glabrate tendency rather than the silky appearance of those of *A. pectinata.*

In describing *A. Lechleriana* Grisebach cited two specimens: *Lechler 2606* and *Lorentz,* near Cienega, Tucuman. According to Hosseus, Bol. Acad. Nac. Cienc. Córdoba 122 (1922), *Lorentz & Hieronymus 578,* Jan. 10–17, 1874, is the authentic collection. It has been the writer's privilege to study a sheet with similar data from the United States National Herbarium. A careful comparison of this with Lechler's specimen from Kew reveals two very distinct species which have a like habit but differ in the foliar and floral characters. In the case of plants which have been personally named for one of their collectors, it is general usage to select his specimen as the type. In accord with this practice *A. Lechleriana* is reserved for the Peruvian plant, while for the Argentinian species the name *A. Grisebachiana* is proposed.

5. **A. sarmentosa**, spec. nov., perennis plus minusve sarmentosa: caulibus decumbentibus et ad nodos haud raro radicantibus: foliis radicalibus orbiculato-reniformibus 5–7-fidis, laciniis cuneatis incisodentatis, pagina infera pilosa glauca; petiolo 2–4 cm. longo pilis patentibus sparse villoso; stipulis villosis membranaceis lanceolato-ovatis integris dentatisve: foliis caulinis similibus minoribus brevius petiolatis vel sessilibus; stipulis foliaceis multifidis, laciniis patentibus vel reflexis: floribus ad apices ramorum in glomerulos bracteatos subracemosos aggregatis brevi-pedicellatis adpresso-pubescentibus: hypanthio elongato-urceolato 1.5–2 mm. longo, laciniis 0.5–0.75 mm. longis ovatis acutis, 4 exterioribus paullo angustioribus: filamentis ca. 0.3–0.5 mm. longis: carpellis 2 longissimo-stipitatis, stigmate clavato.

BOLIVIA: Unduavi, ca. 2400 m. alt., *Rusby 850* (US), 3300 m. alt., *Buchtien 2862* in part (US, TYPE); Incachaca, Prov. Sacaba, Dept. Cochabamba, 2500 m. alt., *Steinbach 5693* (F, G).

In general appearance and in foliar characters this species closely resembles *A. venusta;* it differs, however, in floral features. The well-developed ascending bracts conceal the short pedicels and the lower part of the flowers. Although in this respect *A. sarmentosa* is similar to *A. orbiculata*, it is readily distinguished from its known allies by the long hypanthium with relatively short lobes and the very long-stipitate achenes. The sarmenta and the basal leaves are often tinged with purple and the lower surface of the leaf-blades is conspicuously glaucous; the latter feature is shared in some degree by all the members of the *Orbiculatae*.

6. **A. pascuorum** Standley. Perennial: stems hirsute with spreading or appressed pubescence, decumbent, leafy, branching, occasionally rooting at the nodes: basal and lower stem-leaves orbicular-reniform, 2–4 cm. broad, 5–7-cleft; lobes cuneate-obovate, rounded at the apex, incised-dentate above the middle, green and sparingly pilose above, beneath densely to sparsely pilose and somewhat glaucous; petioles 2 cm. long or less, appressed-pilose; stipules membranaceous, apex dentate: upper leaves decreasing in size with shorter petioles and fewer lobes, the uppermost sessile and 3-cleft; stipules leaf-like in texture, connate, cleft into narrowly oblong spreading or recurving lobes: flowers axillary or terminal in bracted racemosely disposed cymes, short-pedicelled, sericeous: hypanthium 1.5 mm. long, globose-urceolate; lobes acutish, 0.5–1 mm. long, erect or subconnivent, sparsely sericeous or glabrate; the bractlets lanceolate, the sepals lance-ovate: carpels 2–4; stigmas subclavate.—Journ. Wash. Acad. Sci. xvii. 310 (1927).

Costa Rica: bed of the Reventado above Cartago, 1500 m. alt., *Tonduz 9716* in part (US); Rio Birrís, southern slope of Volcán de Irazú, *Standley 35,416* (US); wet open bank, Las Nubes, Prov. San José, 1500–1900 m. alt., *Standley 38,386* (US); Volcán de Turrialba, Prov. Cartago, 2600 m. alt., *Pittier 7558* [*13,195* Herb. Nat. Cost.] (G, US); pastures, southern slope of Volcán de Turrialba, near Finca del Volcán de Turrialba, 2000–2400 m. alt., *Standley 35,028* and *34,940* (US); pastures, vicinity of Fraijanes, Prov. Alajuela, 1500–1700 m. alt., *Standley & Torres 47,627* (US).

This species is related both to *A. pectinata* and to *A. venusta*, resembling the former in its sericeous inflorescence and the latter in the texture and lobing of the leaves.

7. **A. venusta** Schlecht. & Cham. A stoloniferous perennial: stems subvillous, decumbent, leafy, branching, occasionally rooting at the nodes: basal and lower stem-leaves orbicular-reniform, 1.5–3.5 cm. broad, not coriaceous, 5–9-cleft, base shallowly cordate; lobes obovate to broadly cuneate-obovate, above the middle incised-dentate, the upper surface green and sparsely hairy, the lower lighter and villous

to hirsute-villous especially on the nerves and the apices of the teeth; petioles 1–4 cm. long, villous with widely spreading hairs; stipules membranaceous, apex incised: upper leaves similar, decreasing in size with shorter petioles and fewer lobes, the uppermost sessile and tripartite; stipules leaf-like in texture and green, multifid, vaginant with lobes spreading or recurved: flowers axillary or terminal in racemosely disposed cymes, short-pedicelled, small, ca. 2–2.5 mm. long: hypanthium 1.5 mm. long, turbinate-urceolate, densely pubescent; lobes 0.5 mm. long, glabrate, spreading-suberect; the bractlets lanceolate, acute and slightly narrower than the broadly lanceolate sepals: pistils 2–4; stigmas subclavate.—Linnaea v. 573 (1830). *Lachemilla venusta* Rydb. North Amer. Fl. xxii. 382 (1908).—Mexico and Central America.

MEXICO: near Jalapa, Vera Cruz, *Rose & Hough 4268* in part (G, US); *Schiede* (G, TYPE coll.; US); Totutla, Vera Cruz, *Purpus 8864* (G, US); Orizaba, *Mueller 618* (NY); on clay hills, Huatusco, April, 1859, *Mohr* (US); Trinidad Iron Works, Hidalgo, ca. 1350 m. alt., *Pringle 13,520* in part (G, US).

GUATEMALA: mountain slope, Facaltenango, Dept. Huehuetenango, *Caec. & Ed. Seler 2596* (G, US); San Miguel Uspantán, 2000 m. alt., *Heyde & Lux 3322* (G, US); between Tactic and Coban, 2000 m. alt., *von Tuerckheim II 1621* in part (G, US); Chucaneb, Dept. Alta Verapaz, 1500 m. alt., *J. D. Smith 1733* (G, US); in thickets near Tactic, ca. 1200 m. alt., June 1880 and May 1886, *von Tuerckheim 507* (G, US).

The nearest relative is *A. pascuorum* from which it differs in its floral characters. The dully pubescent hypanthium is turbinate-urceolate with segments spreading rather than subconnivent. The lobes of the leaves vary from elongate-obovate in the type to broadly cuneate-obovate. In South America appears a more robust form which is easily distinguished from the typical by slightly plicate leaves with veins prominent on the under surface, tawny pubescence with the hairs growing from bulbous bases, sessile or subsessile cauline leaves, large flowers and glomerulate rather than racemose inflorescence. When other collections are made this may prove to be a good species, but owing to the great variability within the genus, the material at hand is designated as

Var. **fulvescens**, var. nov., caulibus flagelliformibus: foliis leviter plicatis, superioribus sessilibus vel subsessilibus: floribus ad apices ramulorum brevium glomerulatis.

COLOMBIA: Paramo de las Vegas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 15,621* (G); open rocky places along stream, Rio San Rafael, below Cerro Tatama, Dept. Caldas, 2500–2800 m. alt., *Pennell 10,385* (G, TYPE); steep open gulch in forest, Cerro Tatama, Dept. Caldas, 3200–3400 m. alt., *Pennell 10,479* (G, US); Boqueron del Quindio, 3300 m. alt., *André 2233* (NY); San Juan, Quindio, *André 2266* (F, NY); Las Escaleretas, Moras Valley, Rio Paez basin, Tierra Adentro, Cauca, 2500–3000 m. alt., Feb. 1906, *Pittier 1726* (US); Minas, Herb. *Lehmann. B.T. 714* (G).

The following collections are aberrant in having leaves tripartite with lateral lobes bifid and achenes sharply acute: mountain meadow, Ocaña to Pamplona, Colombia, 3000-3300 m. alt., *Kalbreyer 713* (K). Tungurahua, Ecuador, 2700 m. alt., *Spruce 5870* in part (K).

Series III. **Aphanoides.** Herbs with prostrate, decumbent or erect stems: leaves tripartite often appearing 5-parted on account of cleft lateral lobes: inflorescence loosely cymose or glomerulate: texture of the flower more or less delicate: achenes 1–1.5 mm. long; stigmas globose to clavate. Species 8–28.

Key to Species

Hypanthium-lobes biseriate
- Hypanthium pubescent or villous within: inflorescence usually an open racemosely disposed cyme with flowers on pedicels 2–10 mm. long
  - Leaves with lateral segments bifid, appearing 5-lobed: stipules lobed or incised-dentate ..... 8. *A. procumbens*
  - Leaves with lateral segments not bifid, appearing 3-lobed: stipules bifid
    - Entire plant more or less pilose, often reddish green: apices of the obovate-cuneate leaves very deeply incised-dentate or cleft into 3–7 oblong-linear obtusish lobes: stipules spreading: hypanthium sparsely puescent within ..... 9. *A. vulcanica*
    - Entire plant sericeous or somewhat fulvous: apices of the cuneate leaves incised-dentate: stipules strict: hypanthium villous within ..... 10. *A. Jamesonii*
- Hypanthium glabrous within: inflorescence more or less glomerulate

Basal leaves palmately tripartite (cf. *A. sandiensis* and *A. repens*)
- Blades of the middle stem-leaves conspicuously longer than the stipules, uppermost leaf-blades and stipules forming a sheath with spreading uneven lobes
  - Stems prostrate: lateral segments of the leaves variously lobed
    - Leaf-lobelets acute: flowers ca. 3 mm. long, hirsute-villous to sericeous ..... 11. *A. Williamsii*
    - Leaf-lobelets obtuse: flowers ca. 2–2.5 mm. long, glabrous or with scattering hairs on the hypanthium-lobes
      - Plants hirsute or glabrate: sepals ovate
        - Basal leaves broader than long: cauline leaves chiefly subsessile: bractlets lance-ovate: achenes 1–2 ..... 12. *A. frigida*
        - Basal leaves longer than broad: cauline leaves chiefly petiolate: bractlets linear-lanceolate: achenes 2–4 ..... 13. *A. ranunculoides*
      - Plants densely sericeous-villous: hypanthium-lobes oblong-ovate ..... 14. *A. Grisebachiana*
  - Stems decumbent or ascending: lateral segments of the leaves entire or bifid
    - Lateral segments of the leaves shorter than the middle one: stipules membranaceous ..... 15. *A. rupestris*

Lateral segments of the leaves not shorter than the middle one: stipules foliaceous
Flowers pubescent, sometimes glabrous in age
Hypanthium elongate-urceolate, shaggy-villous
16. *A. Standleyi*
Hypanthium urceolate, appressed-villous
Leaves with lateral lobes not bifid, appearing 3-lobed: achenes tapering to a sharp apex
Leaves not deeply tripartite: hypanthium-lobes more or less villous: achenes 5
17. *A. domingensis*
Leaves deeply tripartite: hypanthium-lobes glabrous or nearly so: achenes 1–4
Bractlets conspicuously shorter than the sepals: hypanthium densely pubescent with short spreading hairs. 18. *A. velutina*
Bractlets only slightly if at all shorter than the sepals: hypanthium pubescent with long antrorse hairs. 19. *A. Pringlei*
Leaves with lateral lobes bifid, appearing 5-lobed: achenes acutish or obtusish
Stipules amplexicaul with reflexed lobes: bractlets linear-lanceolate to lanceolate: plants hirsute-villous to pilose
20. *A. sibbaldiaefolia*
Stipules vaginant with spreading lobes: bractlets lance-ovate: plants villous to pilose
Hypanthium-lobes slightly attenuate, the bractlets usually a little longer than the sepals. . . . . 21. *A. Moritziana*
Hypanthium-lobes acute, equal in length
22. *A. aphanoides* var. *tripartita*
Flowers completely glabrous from the first
Leaves variously lobed and incised: stipules spreading: internodes usually short causing the plant to appear leafy. . . . . 22. *A. aphanoides*
Leaves with lateral lobes bifid, appearing 5-lobed, serrate-dentate: stipules reflexed (less conspicuous and smaller in proportion to size of leaf than in *A. aphanoides*): internodes longer than in the above species. . . . . .
20. *A. sibbaldiaefolia* var. *Bourgeaui*
Blades of middle stem-leaves not conspicuously longer than the stipules, uppermost leaves with stipules forming sheaths with lobes ascending and equal as in the *Nivales*
Segments of lower stem-leaves serrate or incised
Plant hirsute-villous: leaves coriaceous, the basal 3–5-fid, the upper 3-fid. . . . . 23. *A. Sprucei*
Plant softly villous: leaves not coriaceous, tripartite. 24. *A. Purdiei*
Segments of lower stem-leaves entire. . . . . 25. *A. holosericea*
Basal leaves subpinnately tripartite
Plant very small, ca. 1 cm. high: blade of basal leaves very small: hypanthium-lobes subequal. . . . . 26. *A. sandiensis*
Plant larger, at least 3 cm. high: blade of basal leaves 5–7 mm. long: bractlets shorter than the sepals. . . . . 27. *A. repens*
Hypanthium-lobes uniseriate. . . . . 28. *A. Rusbyi*

8. **A. procumbens** Rose. A suffrutescent perennial with creeping stems: branches ascending, appressed-pubescent or glabrate: leaves 0.5–2.5 cm. long, tripartite, coriaceous, glabrous, and often somewhat rugose above, sericeous or appressed-pubescent beneath; lobes spatulate to elongate-obovate, coarsely serrate-dentate, the lateral unequally bifid; petioles 2–10 mm. long, appressed-pubescent; stipules leaf-like in texture, oblong, lobed or incised-dentate, slightly adnate to the petioles: inflorescence loosely cymose with branches ascending: pedicels 3–10 mm. long, subtended by lobed or entire bracts: hypanthium 1.5–2 mm. long, campanulate, sericeous outside, densely pubescent within; lobes 8(–10), sericeous or glabrate; bractlets ovate, acuminate, 1.5–2 mm. long (usually one-fourth to half as long again as the broadly ovate acute sepals): achenes 3–8(–11).—Contrib. U. S. Nat. Herb. x. 96 (1906). *Lachemilla procumbens* Rydb. North Amer. Fl. xxii. 382 (1908). *L. costaricensis* Dammer in Fedde, Rep. Spec. Nov. xv. 362 (1918). *L. laxa* Dammer l. c. 363. *L. Uhdeana* Dammer l. c.—Mexico to Bolivia.

Mexico: Sierra Madre (probably Durango), *Seemann 2179* (G); Mt. Orizaba, *Rose & Hay 5728* (G), *5728a* (US); between Pachuca and Real del Monte, Hidalgo, *Rose, Painter & Rose 8691* (US); Sierra de Pachuca, *Rose & Painter 6721* (US); mountains near Pachuca, *Rose & Hough 4947* (US); between Somoriel and Las Lajas, Hidalgo, *Rose, Painter & Rose 9202* (US, TYPE); Manzanilla, vicinity of Puebla, 2180 m. alt., *Arsène & Nicolas 5043* (US), *Nicolas 490* (Bot. Mus. Berlin-Dahlem, TYPE of *L. laxa;* G, phot.), 2250 m. alt., *Arsène 1700* (G, US); Boca del Monte, Puebla, 2300 m. alt., *Arsène 2138* (G, US); Santa Fé, Mexico, *Bourgeau 308* (G); Nevada de Toluca, Mexico, *Rose & Painter 7917* (US); near Salazar, Mexico, *Rose & Painter 7002* (US); below Ajusco, Fed. Dist., *Rose & Painter 7212* in part (G, US); Sierra de Ajusco, Fed. Dist., *Rose & Hay 5325* (G), *5525* (US); Contreras, Fed. Dist., *Orcutt 3526* (US); cool banks, Cima Station, Fed. Dist., ca. 2500 m. alt., *Pringle 10,046* (G, US); Popocatepetl, *Rose & Hay 5998* (G, US); Quinceo, vicinity of Morelia, Michoacan, 2800 m. alt., *Arsène 3245* (G, US); Angangueo, *Schiede* (G), *589* (NY); Sierra de San Felipe, 2500 m. alt., *Pringle 4936* (G, US); without locality, *Coulter 72* (G), *Uhde 1257* (Bot. Mus. Berlin-Dahlem, TYPE of *L. Uhdeana;* G, phot.).

Costa Rica: in oak forest on upper slopes of Vol. Irazú, *Dodge 3420* (G); near summit of Irazú, 3000 m. alt., *Tonduz 4269* (US, ISOTYPE of *L. costaricensis*); Irazú, ca. 2500 m. alt., *Oersted 1666* (US), 3300 m. alt., *Niederlein* (US).

A careful comparison of the type of *A. procumbens* with authentic material of *L. costaricensis* and with photographs of the types of *L. laxa* and *L. Uhdeana* fails to reveal any specific differences. The descriptions of *L. laxa* and *L. costaricensis* would lead one to believe that the flowers of these species were pentamerous, and this character is indicated as a distinctive one separating *L. laxa* from *L. Uhdeana;* but in all the material examined the writer has not found any collection where the flowers were predominantly pentamerous; it is true

that the same plant often bears pentamerous as well as tetramerous flowers, but usually the larger number are tetramerous.

While this species is reasonably constant over most of its range, the following collections from the northern part of Mexico are referred here with some hesitancy: springy places, Sierra Madre, Chihuahua, *Pringle 1235* (G, US); Yerba Buena, above Batopilas, ca. 1800 m. alt., *Palmer 304* (G, US); Sierra Madre, Zacetecas, *Rose 3529* (US); Sierra Madre, west of Durango, ca. 2400 m. alt., *Forrer* (US); on Mt. Morales, San Luis Potosi, *Schaffner 868* (G). In general habit not to be distinguished from *A. procumbens*, but differing in that the leaf-segments are toothed at the apex, the bractlets narrowly lanceolate and only slightly if at all longer than the sepals.

Parry & Palmer's *227* is a puzzle. Although the general habit of the plants of this collection is similar to that of the above species, the larger number of specimens have flowers closely resembling those of *A. vulcanica;* one relatively large plant, however, has small flowers with the hypanthium almost glabrous within. The collection probably represents an aberrant form of *A. procumbens*.

Owing to the variations in the South American material it seems best to set apart the varieties indicated in the following key:

Bractlets acuminate, commonly one-fourth to half as long again as the sepals: disk not at all constricting the throat: leaf-segments spatulate to elongate-obovate
Pubescence soft and appressed. Mexico, Central America
A. procumbens (typical)
Pubescence hirsute and widely spreading. South America.....var. *hirta*
Bractlets acute, usually not exceeding the sepals: disk constricting the throat: leaf-segments cuneate-obovate. South America..var. *andina*

Var. **hirta**, var. nov., caulibus et petiolis et foliis pilis patenter hirsutis.—Differing from the typical form only in its widely spreading hirsute pubescence.

COLOMBIA: field, Murillo, Dept. Tolima, 2200–2600 m. alt., *Pennell 3168* (NY).

ECUADOR: Pichincha, ca. 4000 m. alt., *Jameson 141* (G, TYPE), 3000–4000 m. alt., *Hall 62* in part? (K); without locality, *Jameson 131* (K). Without data, *Lehmann 5911* (NY).

Var. **andina**, var, nov., foliis 0.5–1 cm. longis tripartitis, laciniis obovato-cuneatis apice inciso-serratis: disco fere os calycis claudente; hypanthii laciniis subaequalibus.—*A. tripartita* α Wedd. Chloris Andina ii. 245 (1861).

COLOMBIA: open hillside between Mutiscua and Pamplona, Dept. Norte de Santander, 3000 m. alt., *Killip & Smith 19,750* (G); Paramo de Romeral, Dept. Santander, 3800–4100 m. alt., *Killip & Smith 18,525* (G, TYPE); Paramo de las Puentes, above La Baja, Dept. Santander, 3500–3700 m. alt., *Killip & Smith*

18,201 in part (G); Paramo de las Coloradas, above La Baja, Dept. Santander, 3900–4100 m. alt., *Killip & Smith 18,412* (G); Paramo de Mogotocoro, near Vetas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 17,644* (G); Tuquerres, 3000 m. alt., *Triana* (K).

ECUADOR: wooded hills ca. 8 km. south of Tulcan, Prov. Carchi, 2500 m. alt., *Hitchcock 20,971* (G); Quitensian Andes, *Couthouy* (G); wet places, Quitensian Andes, ca. 4200 m. alt., *Hall* (Bot. Mus. Berlin-Dahlem; G, phot.); Chimborazo and Cotopaxi, 3200–3800 m. alt., *Lehmann 382* (K, US); vicinity of Las Juntas, *Rose, Pachano & Rose 23,182* (G, US).

PERU: Baños, *Wilkes Expl. Exped.* (G; US, *43,797* in part); Agapata, *Lechler 1923* (K); Totorobamba, Dept. Ayacucho, 3600 m. alt., *Weberbauer 5475* (F); Ollantaytambo, ca. 3000 m. alt., *Cook & Gilbert 696* (US).

BOLIVIA: vicinity of Sorata, 2700–3000 m. alt., *Mandon 663* in part (K); Unduavi, 3200 m. alt., *Buchtien 2861* (US); vic. Cochabamba, *Bang 886* (G, US).

Much like *A. procumbens* but a little smaller in all parts except the inflorescence, this variety differs also in that the leaf-segments are broader in proportion to their length and the dentation does not extend below the apex, the hypanthium-lobes are usually equal in length and the disk constricts the throat of the hypanthium. On the whole the collections of the variety are fairly constant, but the material of Bang's *886* is almost glabrous and the hypanthium-lobes are very obtuse, while that of Buchtien's *2861* is either an aberrant or a hybrid form, the plant has the general habit and the foliar characters of this species with flowers very like those of *A. vulcanica*.

9. **A. vulcanica** Schlecht. & Cham. A usually dense low-branching suffrutescent perennial with creeping stems: branches ascending, appressed-pilose, frequently reddish: leaves 3–10 mm. long, tripartite with the lateral lobes very rarely bifid, more or less pubescent on both surfaces or glabrous above, veins impressed; lobes cuneate, deeply incised into 3–7 linear-lanceolate lobules (3 mm. long or less); petioles 3–5 mm. long, appressed-pubescent; stipules leaf-like in texture, vaginant, bifid, the linear lobes usually much longer than the petiole: inflorescence terminal, cymose: pedicels 1–5 mm. long, pubescent: bracts entire or cleft into linear lobes: hypanthium turbinate-campanulate, ca. 1.5 mm. long, the outer surface densely pubescent or appressed-villous, the inner sparsely pilose; lobes 8(–10), spreading, ca. 1.5 mm. long, more or less pilose; the bractlets linear to lanceolate and acute; the sepals lance-ovate to broadly ovate, obtuse or acutish; disk broad: achenes 1–4, stipitate.—Linnaea v. 573 (1830). *Lachemilla vulcanica* Rydb. North Amer. Fl. xxii. 382 (1908). *L. Purpusii* Dammer in Fedde, Rep. Spec. Nov. xv. 362 (1918).—Mexico to Bolivia.

MEXICO: Orizaba, *Schiede 591* (Bot. Mus. Berlin-Dahlem, TYPE; G, phot. and fragm.), *Rose & Hay 5723, 5729, 5773* (all US), ca. 2800 m. alt., *Pringle*

8557 (G, US), ca. 3100–3400 m. alt., *Nelson 284* (US); Vol. Toluca, *Nelson 21* (US); Ixtaccihuatl, *Purpus 1684* (G, US), *3792* (Bot. Mus. Berlin-Dahlem, TYPE or *L. Purpusii;* G, phot. and fragm.); Popocatepetl, *Rose & Hay 5998a* (US); Vol. Colima, Jalisco, *Jones 137* (US); summit of Mt. Zempoaltepec, Oaxaca, ca. 3500 m. alt., *Nelson 629* (US).

GUATEMALA: Vol. Agua, ca. 2000 m. alt., *Kellermann 4899* (US), ca. 3000 m. alt., *J. D. Smith 2158* (US), 3300–3600 m. alt., *Maxon & Hay 3703* (US).

COLOMBIA: Paramo de las Vegas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 15,620* in part (G); Paramo de Mogotocoro, near Vetas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 17,631* in part (G); forest, "Canaan," Mt. Purace, Dept. el Cauca, 3100–3300 m. alt., *Pennell & Killip 6587* (G, US); edge of forest, "Canaan," Mt. Purace, 2900–3000 m. alt., *Killip 6667* (G, US).

PERU: Chachapoyas, *Mathews* (US, *944,180*); Baños, *Wilkes Expl. Exped.* (US, *43,797* in part).

BOLIVIA: Pelechuco, 4000–5000 m. alt., *Pearce* (K); Unduavi, 2000 m. alt., *Rusby 849* (NY).

The divergent tendencies of *A. vulcanica,* although not sufficient to warrant varietal separation, seem worthy of note. The hypanthium-lobes vary much; the bractlets of the Mexican and the Bolivian collections are linear to lanceolate, while those of the Colombian material and Maxon & Hay's *3703* from Guatemala are nearer lance-ovate and the flowers closely resemble those of *A. procumbens* var. *andina.* On the whole the South American material is more or less dull and canescent whereas the Mexican and Central American specimens are bright green tinged with red.

Perhaps the most obvious feature of *A. vulcanica* is the low and usually dense habit. Ordinarily the leaf-segments are 0.5–1 cm. long and cleft into 3–7 spreading or crowded linear lobes; the small distinctive leaves and the comparatively large flowers with the hypanthium pubescent within suffice to separate the species from all except *A. Jamesonii,* its nearest relative; this differs widely in the dense fulvous pubescence, the strict stipules and the broad bractlets of the hypanthium.

10. **A. Jamesonii**, spec. nov., perennis: caulibus ascendentibus vel decumbentibus ramosis: ramis foliosis, internodiis brevibus: foliis 3–5 mm. longis tripartitis crassis utrinque dense adpresso-villosis sericeis; lobis apice 3–5-incisis, dentibus barbatis, lobo medio cuneato, lobis lateralibus paullo obliquis; petiolo 1–2 mm. longo dense adpresso-pubescenti; stipulis connatis petiolo adnatis bifidis undique dense adpresso-pubescentibus strictis: floribus dense adpresso-pubescentibus laxe cymosis, pedicellis 1.5–2 mm. longis: hypanthio campanulato 1.5–1.7 mm. longo intus villoso; sepalis 1–1.2 mm. longis acutis triangulari-ovatis; bracteolis ca. 1 mm. longis ovatis acutis: filamentis ca. 0.7 mm. longis: carpellis 2–4, stigmate globoso.

ECUADOR: *Jameson 19* (K, TYPE; G, phot.); Quitensian Andes, 1855, *Couthouy* (G).

The dense appressed pubescence imparts to the plant a somewhat tawny appearance, while the more or less strict stipular lobes and the divergent angle of the leaves add to the habit a slight stiffness or rigidity. Apart from these two distinctive features the floral characters are somewhat unusual; a dissection of the flower reveals an hypanthium densely villous within, and achenes larger than in any other species. Occasionally toward the apices of the achenes scattering hairs are developed. More material, however, is necessary to determine whether this pubescence is an individual trait or a specific character.

11. **A. Williamsii**, spec. nov., perennis: caulibus humifusis adpresso-villosis 10–12 cm. longis; foliis radicalibus rosulatis tripartitis; lamina ca. 1.5 cm. lata ca. 1 cm. longa orbiculari-reniformi supra sparse pilosa vel glabrata subtus adpresso-villosa; laciniis multifidis, lobulis ca. 3 mm. longis linearibus acutis; petiolo ca. 1.5 cm. longo adpresso-villoso; stipulis membranaceis lanceolato-ovatis acutis subtus adpresso-villosis: foliis caulinis tripartitis subsessilibus, laciniis tridentatis; stipulis foliaceis vaginantibus multifidis, laciniis patentibus linearibus acutis subtus villosis: floribus ad apices ramulorum brevissimorum glomerulatis: hypanthio villoso ca. 1.5–2 mm. longo campanulato, faucibus villosis, laciniis villosis ca. 1.2–1.5 mm. longis oblongo-lanceolatis leviter attenuatis: filamentis ca. 0.7 mm. longis: carpellis 2–3, stylo longe exserto, stigmate globoso.—?*A. orbiculata* β. Wedd. Chloris Andina ii. 244 (1861).

PERU: Dept. Cuzco, Oct. 1839–Feb. 1840, *Gay* (G).
BOLIVIA: grass-lands by stream Challasuyo, near Sorata, 2700–3700 m. alt., *Mandon 663* in part (K); Tolapampa, ca. 2800 m. alt., *Williams 841* (G, phot.; K; NY, TYPE).

The citation in Chloris Andina of a specimen with data similar to those of Gay's would lead one to believe that its identity is *A. orbiculata* β. Wedd. Furthermore, if it had been chosen by Grisebach for the type of *A. Lechleriana*, one might easily understand how he mistook Lorentz's collection from Tucumán for his new species, as the two plants are almost identical in habit; they differ widely, however, in pubescence and in floral characters.

The fully developed flower of *A. Williamsii* is as large as that of *A. orbiculata* with long slightly attenuate hypanthium-lobes and 2–4 filaments subtended by an unusually large tuft of hairs, the achenes have no distinctive traits but the styles are much exserted and the stigmas are globose; the last is an interesting feature since in this group ordinarily one finds clavate stigmas associated with prostrate habit.

Although Gay's specimen was collected sixty years before that of Williams, the data of the latter are so much more definite that it seems preferable to designate it as the type.

12. **A. frigida** Wedd. A hirsute perennial: stems elongate, humifuse: basal leaves 1.5–2 cm. broad, subreniform, 3–5-lobed or -cleft, lobes subcuneate to obovate, incised-dentate with obtusish teeth, above sparingly hirsute or glabrate, below hirsute; stipules membranaceous, lanceolate and acute: stem-leaves subsessile; stipules leaflike in texture, vaginant, 2–4-lobed, the lobes obtusish and spreading: inflorescence terminal on very short lateral branches, glomerulate: flowers ca. 2 mm. long, short-pedicelled, glabrous or with scattering hairs on the hypanthium-lobes: hypanthium 1.5 mm. long, cylindric-urceolate, often ventricose; lobes ca. 0.5 mm. long; the bractlets lance-ovate, commonly a little shorter and narrower than the ovate sepals: achenes 1–2; stigma clavate.—Chloris Andina ii. 245 (1861).

Bolivia: Jeneral Campero, 4200 m. alt., *Asplund 6174* (US).
Argentina: Cerro del Campo, Burruyacu, Tucumán, 1800 m. alt., *Venturi 7728* (G); alpine region, Cerro Champaqui, Sierra Achala, Prov. Córdoba, above 1700 m. alt., *Kurtz 6855* (NY; G, phot.).
The following Bolivian collections have leaves tripartite rather than lobed or cleft: Cochipata, vicinity of Sorata, 2700–3200 m. alt., *Mandon 665* in part (K, NY); Unduavi, ca. 2000 m. alt., *Rusby 850* (G, this collection is *851* in NY), 3300 m. alt., *Buchtien 2862* (G), *(2862) 360* (G), *2862* (US in part).

The collection of *Kurtz 6855* differs from the others in being almost glabrous. It is exceedingly interesting to note the development of the epicalyx in *Buchtien's 2862*. A few flowers have only one or two bractlets, others are marked by a series representing a transition from full-size bractlets to mere rudiments, while a number of flowers are normal with two complete series of hypanthium-lobes.

The species is separable from *A. ranunculoides* by the subreniform basal leaves, the subsessile stem-leaves, and the somewhat conspicuous hypanthium-lobes. Another close relative is *A. Grisebachiana;* this, however, is readily set apart by its dense pubescence.

13. **A. ranunculoides**, spec. nov., perennis: caulibus hirsutissimis humifusis 3–4 dm. longis: foliis radicalibus rosulatis palmati-trisectis; lamina orbiculari-ovata 2–3 cm. lata supra sparse subtus vere hirsuta; terminali segmento rhomboideo-obovato, lateralibus segmentis obliquis 2–3-fidis vel -partitis; margine praeter sinus alte incisis, dentibus linearibus obtusis; petiolo 5–7 cm. longo pilis patentibus hirsuto; stipulis lineari-lanceolatis acutis adpresso-hirsutis: foliis caulinis tripartitis breviter petiolatis (petiolo 6 mm. longo sursum decrescente) vel subsessilibus; stipulis foliaceis vaginantibus multifidis, laciniis patentibus linearibus obtusis: floribus ad apices ramorum vel ramu-

lorum glomerulatis: pedicellis 2 mm. longis vel brevioribus: hypanthio 1.5 mm. longo oblongo-ventricoso glabro; laciniis subaequalibus 0.4 mm. longis obtusiusculis exterioribus lineari-lanceolatis, interioribus ovatis: filamentis 0.2–0.3 mm. longis: carpellis 2–4 longi-stipitatis, stigmate clavato.

BOLIVIA: in damp places, Cochipata, near Sorata, 2700–3200 m. alt., *Mandon 665* in part (K, TYPE; G, phot.).

The basal leaves are orbicular-ovate (longer than broad), 3 cm. or less in diameter, with the middle lobe rhombic-obovate and the laterals trifid or tripartite. The stems, petioles and lower surface of the leaves are copiously but not densely covered with short fine stiffish hairs, which on the leaves develop small bulbous bases. The inflorescence is loosely glomerulate, the flower is glabrous and of so delicate a texture that one can almost count the achenes within the distended hypanthium, the throat is much constricted by the annular disk and the hypanthium-lobes are exceedingly short and connivent. The species is readily distinguished by the unusual lobation of the basal leaves.

14. **A. Grisebachiana**, spec. nov., perennis: caulibus humifusis adpresso-villosis 10–13 cm. longis: foliis radicalibus rosulatis tripartitis; lamina ca. 2 cm. lata et 1.2 cm. longa reniformi utrinque dense sericea; laciniis inaequaliter inciso-dentatis, dentibus rotundato-obtusis; petiolo ca. 2.5 cm. longo sericeo; stipulis elongato-lanceolatis acutis dense sericeis: foliis caulinis breviter pedicellatis vel subsessilibus tripartitis inciso-dentatis; stipulis foliaceis vaginantibus pluri-lobatis, laciniis linearibus obtusis ascendentibus: floribus ad apices ramorum et ramulorum glomeratis ca. 1 mm. longis glabris: hypanthio urceolato; laciniis oblongo-ovatis exterioribus paullo angustioribus: carpellis 2, stigmate clavato. *A. Lechleriana* Griseb. Goett. Abh. xxiv. [Symb. Flor. Argent.] 124 (1879) in part.

ARGENTINA: La Cienega, Sierra de Tucumán, *Lorentz & Hieronymus 578* (F; US, TYPE; G, phot.).

Although the inflorescence of the material at hand is not well-developed and one cannot obtain a definite idea of the size of a mature flower, yet the glabrous buds and the prostrate habit of the plant reveal its affinities. It is closely allied to *A. frigida* and *A. ranunculoides* which have a like habit and glabrous flowers, but lack the dense sericeous pubescence so characteristic of *A. Grisebachiana*. The unusual character-combination of the glabrous flowers and the conspicuously silvery appearance of the plant as a whole serves to make this a very distinct species.

In the discussion of *A. Lechleriana* attention has already been called to the fact that the original description appears to be a combination of the foliar characters of the above described species and the floral features of *Lechler 2606*. The name *A. Lechleriana* has been reserved for the latter.

15. **A. rupestris** HBK. A cespitose perennial with stems and branches loosely decumbent, rooting at the nodes, leafy, branching, fuscous and hirsute: leaves numerous, tripartite, somewhat pilose or glabrate above, densely sericeous-hirsute below; the middle lobes 5–12 mm. long obovate, incised-serrate with obtusish teeth, the lateral shorter and oblique; petioles 5–10 mm. long, gradually reduced up the stem, the leaves subtending the floral shoots sessile; stipules membranaceous, hirsute, deltoid-ovate, acute or obtusish, entire or bifid, vaginant, and adnate to the petioles: floral branches 2–4 cm. long, axillary, with the leaves few and much reduced: inflorescence loosely dichotomous: floral bracts amplexicaul or slightly sheathing: pedicels very short (0.5–0.7 mm. long) and densely hirsute: flowers profusely sericeous-hirsute, the pubescence extending beyond the tips of the hypanthium-lobes: hypanthium 1.5 mm. long, turbinate-campanulate with the throat slightly constricted; lobes 1–1.25 mm. long, acute; the bractlets lance-ovate, equalling or very little shorter than the ovate sepals: pistils 2–4; achenes usually 2, dusky-brown; stigma subglobose.—Nov. Gen. et Spec. vi. 224 (1824). *A. diandra* Willd. ex Steud. Nom. Bot. ed. 2, i. 48 (1840).

ECUADOR: Rucu-Pichincha, *HBK.* 3038 (Bot. Mus. Berlin-Dahlem, ISOTYPE; G, phot.); near the summit of Pichincha, 1836, *Jameson* (K).

Although the flower is somewhat smaller, in the dichotomous branching and the reduction of leaves, the inflorescence of this species closely resembles that of *A. orbiculata;* the general habit, however, is quite different, the short repent and leafy branches replace the leafless sarmenta which are typical of the latter species. The large fulvous stipules are conspicuous and distinctive, a characteristic shared only by *A. erodiifolia* and *A. barbata* of the *Pinnatae.*

16. **A. Standleyi**, spec. nov., perennis: caulibus prostratis rariter ad nodos radicantibus: ramis ascendentibus villosis: foliis 1–1.3 cm. longis tripartitis supra adpresso-pilosis depresse nervatis subtus villosis apice incisis, dentibus lanceolato-ovatis, lobo medio cuneato-obovato, lobis lateralibus bifidis; petiolo 15–5 mm. longo vel supremo nullo; stipulis connatis 2–4-fidis apice inciso-dentatis: cymis terminalibus laxiusculis racemiformibus; floribus breviter pedicellatis villosis; hypanthio ca. 2 mm. longo elongato- vel globoso-urceolato;

laciniis 8(–10) ca. 1 mm. longis glabrescentibus acutis, exterioribus lineari-lanceolatis subaequalibus vel quam interiores ovatae paullo longioribus: filamentis ca. 0.75 mm. longis: carpellis 4–10; acheniis ovoideis apiculatis.

COSTA RICA: Cerro de las Vueltas, PROV. San José, 2700-3000 m. alt., *Standley & Valerio 43,596, 43,622, 43,893* (TYPE), *43,973* (all US); pastures, Copey, 1800 m. alt., *Tonduz 11,907* (US); Monts de Velirla, Copey, 1800–2000 m. alt., *Tonduz 12,218* (US); forests, Cerro del Roble, Copey, 2600–2700 m. alt., *Tonduz 11,810* (US); Cerro de la Muerte, 3100 m. alt., *Pittier 10,469* (US).

This species is one of the many forms distributed under the name of *A. tripartita* from which it is readily distinguished by floral characters. The flowers are shaggy-villous and unusually large, the bractlets are linear-lanceolate and often slightly longer than the ovate sepals; furthermore, a floral dissection frequently reveals as many as eight fully developed achenes. Ordinarily the number of carpels in the *Aphanoides* is 2–4(–5), but *A. Standleyi*, *A. procumbens* and *A. holosericea* show a range of 3–10 with a general average of 5–6 in contrast to 2–4 in the other species of the group. The achenes of *A. Standleyi* closely resemble those of *A. Pringlei* in having sharply pointed apices, but the flowers of the two are quite different in general appearance.

17. **A. domingensis** Urban. Perennial with creeping stems: branches ascending, purplish, copiously pilose: leaves trifid or not deeply tripartite, glabrescent above, pilose below; lobes cuneate, 4–8 mm. long, deeply pectinate-serrate with obtusish teeth; lower leaves petiolate (petioles 5 mm. long or less), the upper sessile; stipules leaf-like in texture, connate, usually deeply cleft into 2–4 linear lobes, pilose on the lower surface: inflorescence glomerulate towards and at the apices of the branches: flowers short-pedicelled or sessile, beset with very fine hairs: hypanthium globose-urceolate, 1.25–1.5 mm. long; lobes ca. 0.8 mm. long, the outer linear-lanceolate, the inner ovate-lanceolate to ovate: achenes commonly 5, short-stipitate. —Symb. Antill. v. 349 (1907). *Lachemilla domingensis* Rydb. North Amer. Fl. xxii. 384 (1908).

SANTO DOMINGO: bank of stream near Constanza in Valle nuevo, 2200 m. alt., *von Tuerckheim 3141* (G, US).

A. domingensis is the only species of *Alchemilla* known from the West Indies and this only from the type-locality. Its nearest relative is *A. Standleyi* of Costa Rica from which it differs in being somewhat smaller, having leaves less deeply cleft and achenes not so sharply-pointed. Possibly the two species are only varietally distinct, but owing to the lack of abundant insular material and on

phylogenetic grounds it seems best to treat the continental material as specifically distinct, at least provisionally.

18. **A. velutina** Watson. Perennial: stems erect or decumbent, branching, appressed-pubescent: leaves tripartite, usually glabrous above, sparingly pilose below; middle lobe cuneate, 4–8 mm. long, incised-dentate with 3–5 obtuse teeth, lateral lobes entire to tridentate; lower leaves petiolate (petioles 2–5 mm. long), the upper sessile: stipules connate, usually cleft into 2 linear-oblong obtuse lobes: inflorescence axillary; flowers in small glomerules, very short-pedicelled: hypanthium ellipsoid, ca. 0.75 mm. long, densely pubescent with short spreading hairs; sepals ca. 0.5 mm. long, ovate, often twice as long as the lanceolate bractlets: achene 1; apex sharply tapering.—Proc. Amer. Acad. xvii. 354 (1882). *Lachemilla velutina* Rydb. North Amer. Fl. xxii. 383 (1908).

Mexico: in marshes about the city, San Luis Potosi, *Schaffner 870* (G, type; US); Alvarez, San Luis Potosi, *Palmer 125* (US), *Orcutt 1711* (US); Sierra de Pachuca, Hidalgo, *Rose & Rose 11,487* (US); rocky mesas, Buena Vista Station, Hidalgo, ca. 2200 m. alt., *Pringle 8885* (G, US); Esperanza, vicinity of Puebla, 2450 m. alt., *Arsène 2112* (US).

Very closely related to *A. Pringlei* var *minor* from which it differs in the velvety pubescence of the hypanthium, the relative length of its lobes and the somewhat irregular dentation of the leaves. It is interesting to note that while the hypanthium-lobes are glabrous, there is often a single rather long hair on the tip of each lobe. The plant is much smaller than *A. Pringlei* in all parts except the achenes which are quite similar in size and contour.

19. **A. Pringlei** Fedde. Perennial: stems ascending or erect, branching, sparsely spreading-hirsute: leaves light-green, tripartite, usually glabrous above and sparingly hirsute below, the lower petiolate (petioles 5 mm. long or less), the upper sessile; lobes obovate to cuneate and coarsely serrate-dentate, the lateral only rarely bifid; stipules cleft into 2–4 lance-linear or oblong lobes, leaf-like in texture, amplexicaul: flowers in terminal or axillary glomerules, very short-pedicelled: hypanthium broadly urceolate (ca. 1 mm. long and 1.5 mm. wide), antrorsely hirsute; throat constricted by an annular disk; lobes ca. 0.7 mm. long, glabrate or glabrous, acute, the bractlets lanceolate and often slightly shorter than the ovate sepals: achenes 2–4, sharply pointed.—Bot. Jahresb. xxxvi. 496 (1910). ?*A. hirsuta* β *campestris* Schlecht. & Cham. Linnaea v. 572 (1830). *Lachemilla Pringlei* Rydb. North Amer. Fl. xxii. 383 (1908).

Mexico: Alvarez, San Luis Potosi, *Palmer 125* in part (G), *125b* in part (US); wet banks, Trinidad Iron Works, Hidalgo, ca. 1500 m. alt., *Pringle 10,031* (G,

US); between Pachuca and Real del Monte, Hidalgo, *Rose & Painter 6655* in part (G, US), *Rose, Painter & Rose 8705* (US); between Santa Barbara and Cristo, vicinity of Puebla, June 27, 1907, *Arsène*, (US, *1,004,223*), *10,052*, *10,053*, (US); Boca del Monte, vicinity of Puebla, 2300 m. alt., *Arsène 7097* (US); Amecameca, ca. 2700 m. alt., *Kuntze 23,697* (NY); Ixtaccihuatl, 2000–2300 m. alt., *Purpus 30* (US); Pedrigal, Valley of Mexico, *Rose & Painter 7212* in part (G, US), *7213* in part (US); Sierra de San Felipe, Oaxaca, ca. 1900 m. alt., *Pringle 4876* (G; NY, TYPE; US), ca. 2500 m. alt., *4935* (G, US); vicinity of Totontepec, ca. 1500–1800 m. alt., *Nelson 733* (US); without locality, *Pringle 10,030* (G, US).

The collections *Purpus 30* and *Rose & Painter 6655* are somewhat aberrant. Purpus's specimen is almost as near *A. velutina* as *A. Pringlei* and that of Rose & Painter shows similar tendencies in having larger flowers with the pubescence of the hypanthium shorter than usual and somewhat spreading. In general habit and achene-characters *A. Pringlei* is singularly like *A. velutina* but may be readily distinguished by the long antrorse pubescence of the hypanthium, the larger flowers and the coarser habit.

In the *Aphanoides* frequently one finds transitional stages between the axillary and terminal forms of inflorescence; *A. Pringlei*, however, contains definite examples of the two extremes (cf. *Pringle 4876* and *4935*); this is somewhat unusual and seems worthy of mention since the mode of inflorescence has been used as a character for separating species.

A. Pringlei is comprised of three well-marked varieties readily distinguished by the following characters:

Leaf-segments coarsely toothed.....*A. Pringlei* (typical)
Leaf-segments 3-7-fid
  Flower ca. 1.7 mm. long: hypanthium-lobes equal in length
    var. *orizabensis*
  Flower ca. 1.2–1.5 mm. long: bractlets slightly shorter than the sepals.....var. *minor*

Var. **orizabensis** (Rydb.), comb. nov., leaves tripartite; segments 0.5–1 cm. long, cuneate, cleft into 3–5(–7) linear obtusish lobules: hypanthium ca. 1 mm. long; lobes ca. 0.7 mm. long, the bractlets linear-lanceolate and as long as the broadly ovate sepals.—*Lachemilla orizabensis* Rydb. North Amer. Fl. xxii. 383 (1908). *Alchemilla orizabensis* Fedde, Bot. Jahresb. xxxvi. 496 (1910).

MEXICO: Orizaba, *Rose & Hay 5683* (G, US), *Mueller 1352* not *1353* as given in the original description (NY, TYPE of *L. orizabensis*), ca. 2500 m. alt., *Seaton 480* (G, US); without locality, *Coulter 71* (G). The following collections differ only in being glabrate or in some cases even glabrous: Orizaba, ca. 2500 m. alt., *Seaton 482* (G, US); between Pachuca and Real del Monte, Hidalgo, *Rose & Painter 6655* in part (G, US); Ajusco, Fed. Dist., *Orcutt 3713* (US); near Cima, *Rose & Painter 7167* in part (US).

Both the lobation of the leaves and the more or less open inflorescence recall *A. vulcanica* from which it differs in that the flowers are much smaller, the hypanthium is glabrous within and the sepals are not so broadly ovate; it is interesting to note, however, that the dissection of a young flower reveals pubescence extending well below the throat and scattering hairs within the hypanthium, which apparently disappear as the flower matures. Possibly the varietal divergence from the species is due to hybridity rather than to some orthogenetic trend. Phylogenetically the tendency appears worthy of some consideration.

Var. **minor**, var. nov., foliis tripartitis, laciniis 3–7-fidis: hypanthio 0.75 mm. longo, laciniis 0.5 mm. longis: carpello 1.

MEXICO: Alvarez, San Luis Potosi, *Palmer 125* in part (G, US); below Ajusco, Valley of Mexico, *Rose & Painter 7212* in part (US); Ajusco, *Rose & Painter 7213* in part (US); rocky hills, Lena Station, Hidalgo, ca. 2100 m. alt., *Pringle 10,042* (G, TYPE; US); vicinity of Puebla, 2130 m. alt., *Arsène 1245* (US); La Cima, ca. 2500 m. alt., and Jalapa 1500 m. alt., *Kuntze 23,718* (NY); lava beds near Eslava, Fed. Dist. 2000 m. alt., *Rusby 62,133* (US); Real del Monte, *Ehrenberg* (US, *617,063*); vicinity of Morelia, Michoacán, 1900–2100 m. alt., *Arsène 6583, 10,048, 10,049* (all US).

In the collection of *Arsène 1245* the flowers are almost glabrous, while those of *O. Kuntze 23,718* are densely appressed-pilose. These represent the extremes, the remaining specimens are fairly constant in pubescence.

Var. *minor* covers the same geographical range as typical *A. Pringlei*, in fact the two are often mixed in one collection. In segmentation and contour the leaves closely resemble those of var. *orizabensis*, but the flowers are similar to those of typical *A. Pringlei* differing only in being smaller and narrower and in producing but one achene.

20. **A. sibbaldiaefolia** HBK. Perennial: stems ascending or decumbent, subsimple or branched, appressed- or somewhat spreading-hirsute to pilose: lower leaves petiolate (petioles 3–6 mm. long) and tripartite with the lateral lobes bifid; the upper subsessile and tripartite; lobes narrowly obovate to oblanceolate, incised-serrate, dark-green and glabrate above, paler and appressed-pubescent beneath; stipules appressed-pubescent beneath, ca. the length of the petiole, leaf-like in texture, connate, cleft into 2–4 linear-oblong lobes: flowers in congested clusters towards and at the apices of the stems and branches: pedicels very short: hypanthium campanulate-urceolate, appressed-pubescent; lobes acute and equal in length; the bractlets lanceolate, the sepals ovate: achenes 2 or 3; stigmas globose.—Nov. Gen. et Spec. vi. 225, pl. 561 (1824). *Lachemilla sibbaldiaefolia* Rydb.

North Amer. Fl. xxii. 384 (1908). *L. Schiedeana* Rydb. l. c. 382. *A. Schideana* Fedde, Bot. Jahresb. xxxvi. 496 (1910).

MEXICO: near Tianguillo, *HBK.* (ISOTYPE, Bot. Mus. Berlin-Dahlem, phot. G.); Orizaba, *Botteri 163* (G, US); Cerro San Miguel, vicinity of Morelia, Michoacan, 2100 m. alt., *Arsène 5209* (G, US); vicinity of Morelia, 2200 m. alt., *Arsène 5629* (G, US).

The name *A. sibbaldiaefolia* has been applied to almost as many species as *A. tripartita*. Possibly this may be explained by the fact that the descriptions emphasized the generic details rather than the specific distinctions which in this case are difficult to define. The species is very closely allied to *A. aphanoides* var. *tripartita* which differs in the pubescence, the somewhat firmer texture of the leaves and stipules as well as the more broadly obovate leaf-lobes. In pubescence and leaf-serration *A. sibbaldiaefolia* passes to the following fairly definite variations:

Leaves coarsely serrate-dentate. Mexico
  Plant appressed-hirsute or sericeous: hypanthium and its lobes pubescent.....*A. sibbaldiaefolia* (typical)
  Plant glabrate: hypanthium and its lobes glabrous.....var. *Bourgeaui*
Leaves lacerate-serrate. Costa Rica, Guatemala and southern Mexico.
  Plant sparsely hirsute or pilose: hypanthium pubescent, but its lobes glabrate.....var. *Tonduzii*

Var. **Bourgeaui** (Rydb.), comb. nov., plant glabrate: leaves coarsely incised-dentate: hypanthium and its lobes glabrous.—*Lachemilla Bourgeaui* Rydb. North Amer. Fl. xxii. 384 (1908). *A. Bourgeaui* Fedde, Bot. Jahresb. xxxvi. 496 (1910).

MEXICO: Santa Fé, Valley of Mexico, *Bourgeau 308ter* (G); Loma Santa Maria, vicinity of Morelia, Michoacan, 1950 m. alt., *Arsène 5531* (US); 2000 m. alt., *Arsène 10,051, 10,054* (US); Cerro Azul, Morelia, Michoacan, 2200 m. alt., *Arsène 6181* in part (US).

Apart from the glabrous flowers these collections are very like *A. sibbaldiaefolia* both in general appearance and in technical details, and since they grow in the same region they do not seem to merit more than varietal separation.

Var. **Tonduzii** (Dammer), comb. nov., plant sparsely hirsute or pilose: leaves lacerate-serrate: hypanthium pubescent and its lobes glabrate or nearly glabrous.—*Lachemilla Tonduzii* Dammer in Fedde, Rep. Spec. Nov. xv. 362 (1918).

MEXICO: top of Sierra Madre, near Chilpancingo, Guerrero, 3000–3400 m. alt., *Nelson 2208* (US); Chiapas, *Ghiesbreght 82* in part (G).
GUATEMALA: Santa Rosa, Dept. Baja Vera Paz, ca. 1500 m. alt., *von Tuerckheim 1208B* in part (G, US), ca. 1600 m. alt., *von Tuerckheim II 2335* (US).

COSTA RICA: Viento Fresco, Prov. Alajuela, 1600–1900 m. alt., *Standley & Torres 47,844* (US); Vara Blanca, between Poás and Barba volcanoes, 1600–1700 m. alt., *Maxon & Harvey 8385* (US); along the cart-road from Vara Blanca to La Concordia, 1600–1950 m. alt., *Maxon & Harvey 8399* (US); along the road between La Lecheria and the Hotel, Vol. Poás, 2100–2600 m. alt., *Standley 34,838* (US); near the summit of Irazú, 3000 m. alt., *Tonduz 4268* (US, ISOTYPE of *L. Tonduzii*); Vol. Turrialba, 2800 m. alt., *Pittier 7559* (G, US); in dense oak and bamboo forest near Laguna de la Escuadra, northeast of El Copey, Prov. San José 2000–2200 m. alt., *Standley 41,992* (US); Laguna de la Chonta, northeast of Santa Maria de Dota, Prov. San José, 2000–2100 m. alt., *Standley 42,228* (US); near Finca la Cima, above Los Lotes, north of El Copey, 2100–2400 m. alt., *Standley 42,551* in part, *42,760* (US); oak forest near Quebradillas, about 7 km. north of Santa Maria de Dota, 1800 m. alt., *Standley 43,029* (G, US); vicinity of Santa Maria de Dota, 1500–1800 m. alt., *Standley & Valerio 43,382* (US); Rio Reventado, Prov. Cartago, ca. 1500 m. alt., *J. D. Smith 4773* (G, US).

The Mexican collections are placed here with some hesitancy, and the material from Guatemala is somewhat aberrant in having attenuate hypanthium-lobes, while the leaves of Smith's *4773* (Costa Rica) are not so deeply incised nor are the teeth spreading, but the flower matches that of var. *Tonduzii*. On the whole the collections are reasonably constant, the only observable variations from the species being the slightly lacerate leaf-serration and the glabrate hypanthium-lobes.

Apparently *A. Schiedeana* is an abnormal form of *A. sibbaldiaefolia*. The lower stem is simple, the upper divides into growing shoots three of which are vegetative and one floriferous. The flowers are 2.5 mm. long and 0.5–0.75 mm. wide. In one dissection the two carpellary stipes were densely pilose near the base and greatly enlarged, also elongated so that the achenes protruded from the throat of the hypanthium. None of the flowers are mature. The writer suggests that through the influence of some injurious agent, the upper portion of the plant developed somewhat abnormally.

21. **A. Moritziana** (Dammer), comb. nov., suffruticose perennial: stems erect, 15–20 cm. high, densely branched, hirsute: leaves ca. 1.5 cm. long, tripartite, appressed-pilose above, hirsute below; lobes obovate-cuneate, beyond the sinuses coarsely dentate-serrate, the lateral unequally bifid; petioles ca. 3 mm. long, hirsute; stipules leaf-like in texture, connate, bifid with lobes usually longer than the petioles and incised-dentate: flowers in congested clusters towards and at the apices of the branches: pedicels very short (1 mm. long): floral bracts obovate, irregularly incised, much longer than the pedicels: hypanthium campanulate, 1.2–1.5 mm. long, sericeous or appressed-hirsute; lobes glabrate, acute, 0.7–1 mm. long; bractlets lanceolate, as long as or very little longer than the ovate sepals:

achenes 2–4, sharply pointed.—*Lachemilla Moritziana* Dammer in Fedde, Rep. Spec. Nov. xv. 364 (1918).

COLOMBIA: Sierra Nevada, *Moritz 1116* (Brit. Mus. ISOTYPE; G, phot. and fragm.).

Although the original description gives the measurements of the hypanthium and its lobes as 0.75 and 1–1.25 mm. long respectively, an isotypic fragment has flowers with the hypanthium 1.2–1.5 mm. long and hypanthium-lobes 0.7–1 mm. long. The proportion of the latter dimensions rather than the former is common in this section of *Alchemilla*.

On account of the paucity of material it is somewhat difficult to tell whether this collection merits specific rank or is only a form of *A. aphanoides* var. *tripartita*. It is true, however, that the achenes are much more sharply-pointed than those of var. *tripartita* and the hypanthium-lobes are somewhat attenuate.

22. **A. aphanoides** Linn. f. Perennial: stems erect or decumbent, subsimple or branched, densely to sparsely pilose: leaves tripartite, the lower petiolate and more or less pilose or villous, the upper sessile and usually glabrous; segments 2–3-multifid or incised-dentate, oblanceolate to cuneate-obovate; lobules oblong-linear, acute; stipules leaf-like in texture, 2–4-lobed or -cleft, connate, adnate to the petioles or with the sessile upper leaves forming many-lobed or -cleft perfoliate leaves: flowers aggregated in axillary and terminal cymes, usually very short-pedicellate subtended by lobed bracts: hypanthium urceolate, at maturity glabrous; lobes 8, acute and commonly equal in length; the bractlets lanceolate to lance-ovate, the sepals ovate: achenes 1–3; styles usually not protruding; stigmas globose.—Suppl. 129 (1781); HBK. Nov. Gen. et Spec. vi. 225 (1824).

VENEZUELA: Caracas, *Linden 442* in part (K); Sierra Nevada de Mérida, 3000–3500 m. alt., Dec. 1923, *E. P. de Bellard* (US); Paramo Santo Domingo, Mérida, 3600 m. alt., *Jahn 1153* (US).

COLOMBIA: Nevada de Santa Marta, *Purdie* (K); Ocaña to Pamplona, *Kalbreyer 729* (K); Paramo de Santurban, near Vetas, Dept. Santander, 3950–4160 m. alt., *Killip & Smith 17,512* (G); Paramo de Romeral, Dept. Santander, 3800–4100 m. alt., *Killip & Smith 18,539* (G); open hillside, western slope of Paramo de las Puentes, above La Baja, Dept. Santander, 3300–3400 m. alt., *Killip & Smith 18,738* (G); Paramo de las Puentes, above La Baja, Dept. Santander, 3500–3700 m. alt., *Killip & Smith 18,223 and 18,201* in part (G); western slope of Paramo Rico, Dept. Santander, 3200 m. alt., *Killip & Smith 17,853* (G); east of Neiva, Dept. Huila, *Rusby & Pennell 888A* (NY); near Facatativa, 2630 m. alt., *André 615, 652* (NY); El Chorro, near Tulua river, Sept. 14, 1853, *Holton 935* (NY); Cruz Verde, Jan. 20, 1854, *Holton 934* (K); bushy slope above Bogotá, 2700–2800 m. alt., *Rusby & Pennell 1267* (G, US); bushy mountain slope, above Bogotá, 2700–2800 m. alt., *Rusby & Pennell 1267A* (US); Andes of Bogotá, 2700 m. alt., *Triana 4201* (K, US); wayside

above Salento, Dept. Caldas, 2100–2500 m. alt., *Pennell 8883* (G, US); field, clearing, "Pinares," above Salento, Dept. Caldas, 2700–2900 m. alt., *Pennell 9408* (G, US); forest, Salento to "Laguneta," Old Quindio Trail, Dept. Caldas, 2500–2800 m. alt., *Killip & Hazen 9121* (G, US); San Juan, Quindio, *André 2266* (G); field, loam, Murillo, Dept. Tolima, 2200–2600 m. alt., *Pennell 3169* (G, US); meadow, "Rosalito" near Paramo de Ruiz, Dept. Tolima, 2800–3100 m. alt., *Pennell 2950* (US); Paramo de Ruiz, *Purdie* (K); Las Escaleretas, Moras Valley, Rio Paez basin, Tierra Adentro, Cauca, 2500–3000 m. alt., *Pittier 1346* (US); Minas, Herb. *Lehmann B.T. 717* (NY); without locality, *Mutis* (Brit. Mus., ISOTYPE; G. phot.).

ECUADOR: wooded hills ca. 8 km. south of Tulcán, Prov. Carchi, 2500 m. alt., *Hitchcock 20,971* (US); in ravines near Quito, *Hartweg* (K); plains of Quito, *Jameson 157* (K); mountain forests, Tungurahua, 2700 m. alt., *Spruce 5870* in part (K); stony places, Tungurahua, *Spruce 6105* (K); Cañar, *Rose & Rose 23,790* (US); without locality, *Seemann bis* (K).

PERU: Prov. Chachapoyas, *Matheus* (K); open sunny banks, 19 km. south of Panao, 3000 m. alt., *Macbride & Featherstone 2208* (F, US); hills, Huanuco, ca. 2700 m. alt., *Pearce 65* (K); stony places, Rio Blanco, ca. 3600 m. alt., *Macbride & Featherstone 686* (F, US); grassy hills, Agapata (Ayacucho), *Lechler 1916* (K); Ollantaytambo, ca. 3000 m. alt., *Cook & Gilbert 701* (US).

BOLIVIA: wet places, Cochipata, near Sorata, Prov. Larecaja, 2700–3200 m. alt., *Mandon 665* (G, NY); Sorata, ca. 3900 m. alt., *Rusby 477* (US), *Williams 2389* (US); Pongo (near Unduavi), ca. 3600 m. alt., *Tate 247* (US); Unduavi, 2000–2600 m. alt., *Bro. Julio 422* (US), ca. 3000 m. alt., *Rusby 476* (G, K, US), 3300 m. alt., *Buchtien 108* (G); Yungas de San Mateo, Comarapa, Dept. Santa Cruz, 2600 m. alt., *Steinbach 8439* (G).

The above cited specimens include those with flowers pubescent or glabrous in the bud, and chiefly glabrous at maturity. It might be of special interest to note that Triana's *4201* which probably typifies Weddell's unnamed variety has glabrate rather than glabrous flowers, and some of the specimens represented by *Killip & Hazen 9121* and *Pennell 9408, 8883* are densely villous or hirsute with glabrate to glabrous flowers, the pubescent condition possibly indicating an earlier or a later seasonal growth. A collection particularly divergent is that of *Spruce 6105* closely resembling the Mexican *A. velutina* in general habit, size and relative length of hypanthium-lobes, but firmer in texture and possessing a glabrous or puberulent inflorescence; however, since the material at hand is insufficient to reveal more definite specific qualifications and affinities, at present it seems best referred here. Perhaps attention should also be called to the fact that the Bolivian material as a whole is characterized by large flowers with ventricose hypanthia and linear-lanceolate bractlets.

It has seemed almost impossible to find stable characters to distinguish species in the complex aggregate of material passing as *A. aphanoides*, *A. subalpestris* and *A. tripartita*. Without regard to geographic range, the collections might be arranged in a sequence showing a gradual variation in the amount of pubescence from almost

glabrous to densely villous, with the variation accounted for in some measure by differences in altitudes and seasonal growths; for the most part general pubescence is a negligible factor in the determination of specific units. The following features have been fairly constant in other species: the size and the pubescence of the flower, the shape of the hypanthium-lobes, the stipular lobes and their direction, and the dentation of the leaves. In *A. aphanoides* and its varieties, however, the flowers are 1.5–3 mm. long with such alternatives in pubescence as the following: in bud, on the one hand, pubescent but at maturity pubescent or wholly glabrate; or, on the other hand, completely glabrous from the first. It would seem as if there ought to be a specific difference here, but there is no natural line of differentiation. Close study of abundant material reveals only elusive differences, and the species formerly called *A. tripartita* is therefore believed to be the pubescent extreme of *A. aphanoides*. This view is strengthened by the fact that certain collections of *A. aphanoides*, while corresponding to the typical in other characters, have flowers as large as and closely resembling those of authentic material of *A. tripartita*, pubescent in the bud but completely glabrate at maturity and except in size (a weak character in itself) inseparable from the glabrous inflorescence of *A. aphanoides*. As a distinctive character the shape of the hypanthium-lobes is equally uncertain being ovate, lance-ovate or at times lanceolate with both series similar in contour or the outer slightly narrower. Lacking a definite correlation of other features, this variation is too slight to be of value in segregating species or even varieties. The remaining characters do not appear to be of greater value; the perfoliate spreading sheaths formed by the adnation of the stipules and the upper leaves are often obtusely lobed appearing more or less circular, or deeply cleft in outline resembling conventional stars; furthermore, the segments of the lower leaves may be deeply multifid or only incised-dentate. The following are the only differences observed sufficient to warrant even varietal distinction:

Flowers glabrous at maturity
  Lower parts of the plant and new shoots usually densely pilose: flowers 1.5–3 mm. long; hypanthium-lobes connivent to spreading. South America ..... *A. aphanoides* (typical)
  All parts of the plant sparingly pilose to glabrate: flowers 1.5–2 mm. long: hypanthium-lobes usually erect and slightly shorter in proportion to the length of the hypanthium than in the typical variety. Mexico and Central America ..... var. *subalpestris*

Flowers pubescent at maturity ..... var. *tripartita*

Var. **subalpestris** (Rose), comb. nov., plant sparingly pilose: leaves varying from incised-dentate to laciniate: flowers glabrous or with scattering hairs; hypanthium-lobes short, usually not more than 0.5 mm. long.—*A. subalpestris* Rose, Contrib. U. S. Nat. Herb. x. 96 (1906). *Lachemilla subalpestris* Rydb. North Amer. Fl. xxii. 384 (1908).

Lower California: Sierra de San Francisquito, Oct. 1, 1899, *Brandegee* (US, *736,159*); Sierra de Laguna, *Brandegee 214* (G).

Mexico: near Colonia Garcia in the Sierra Madre, Chihuahua, *Nelson 6173* (G, US); Colonia Garcia, ca. 2500 m. alt., *Townsend & Barber 207* (G, US); between Santa Gertrudis and Santa Teresa, Sierra Madre, Nayarit, *Rose 2092* (G, US); wet places, Sierra Madre, Chihuahua, *Pringle 1236* (G, US); Alvarez, San Luis Potosi, *Palmer 125a* (US), *125* in part (G); San Luis Potosi, 2000–2300 m. alt., *Parry & Palmer 721* (G, US); Mt. San Miguelito, San Luis Potosi, *Schaffner 869* (G); between Pachuca and Real del Monte, Hidalgo, *Rose, Painter & Rose 8687* (US); mountains near Pachuca, *Rose & Hough 4954* (US); Nevada de Toluca, Mexico, *Rose & Painter 7928* (US, type of *A. subalpestris*); near Salazar, *Rose & Painter 7003* (US); Cima, Mexico, Aug. 14, 1905, *Pringle*, (US); near Cima, *Rose Painter 7167* in part (US); near El Parque, Morelos, *Rose & Painter 7233* (US); fields, near Patzcuaro, Michoacan, *Pringle 4005* (G, US); Cerro Azul, vicinity of Morelia, Michoacan, 2200 m. alt., *Arsène 10,050* (US); ca. 28 km. southwest of the city of Oaxaca, 2500–3700 m. alt., *Nelson 1394* (US); Cerro de La Raya, Cuyamecalco, Dist. of Cuicatlan, Oaxaca, 2700 m. alt., *Conzatti 2426* (US); Sierra de San Felipe, Oaxaca, ca. 3000 m. alt., *Pringle 4934* (G, US); near Reyes, Oaxaca, 2000–3000 m. alt., *Nelson 1790* (US).

Guatemala: Cuesta de la Concepcion, Dept. Huehuetenango, 1600–2000 m. alt., *Caec. & Ed. Seler 2872* (G); Santa Rosa, Dept. Baja Verapaz, *Cook 245* (US), 1500–2000 m. alt., *von Tuerckheim 1208* (G, US).

Costa Rica: near Finca La Cima, above Los Lotes, north of El Copey, Prov. San José, 2100–2400 m. alt., *Standley 42,551* in part (US).

The collections of this variety from the Sierra Madre are exceedingly like those of *A. Pringlei*, yet since it has been almost impossible to separate them from *A. aphanoides* they have been treated as a variety of the latter species.

The basal leaves are orbicular-reniform in outline and tripartite with the segments variously toothed or cleft, while the upper are diverse in size, contour and secondary incisions. One collection (*Pringle 1236*, G) illustrates particularly well the variation of the stem-leaves: the specimen has two shoots springing from a single root, the leaves of one so reduced that they differ from the stipular lobes only in length; while those of the other are well-developed, and although smaller, closely resemble the basal leaves. From the states of San Luis Potosi and Michoacan many of the collections have leaf-segments and stipules very deeply cleft into long linear lobules presenting a marked contrast to the broad obtuse lobules of Nelson's *1394* from Oaxaca. These appear to be mere extremes of a highly variable form.

Var. **tripartita** (R. & P.), comb. nov., for the most part densely villous: leaves tripartite with lateral lobes bifid: flowers pubescent at maturity.—*A. tripartita* R. & P. Fl. Peruv. i. 68 (1798). *Aphanes tripartita* Pers. Syn. Pl. i. 150 (1805). *Lachemilla tripartita* Rydb. North Amer. Fl. xxii. 383 (1908).

VENEZUELA: Paramo Agua de Obispo, 2500 m. alt., *Jahn 1176* (US); Paramo del Tambor, Mérida, 2400 m. alt., *Jahn 739* (US).
COLOMBIA: open hillside, vicinity of La Baja, Dept. Santander, 2700–3500 m. alt., *Killip & Smith 18,045* (G); near Bogotá, 2800 m. alt., *Macdouall* (US, *865,458* in part); Paramo above Bogotá, *Ariste-Joseph 1896* (US); without locality, 1898, *Nicholas* (NY).
PERU: Pillao, *Ruiz* (Bot. Mus. Berlin-Dahlem; G, fragm.).
BOLIVIA: Challasuyo, vicinity of Sorata, Prov. Larecaja, 2700–3200 m. alt., *Mandon 663* (G).

As prolonged study of this particularly puzzling group failed to reveal constant distinctions, it does not seem so strange that only seven of the numerous collections named *A. tripartita* really happen to belong here. Even these vary in size of flower and other minor details, but are otherwise fairly constant in habit and pubescence. While *A. tripartita* may be a distinct species the writer does not feel justified in maintaining it as such on the character of pubescence only.

The collection of *Ariste-Joseph 1896* has flowers conspicuously different from the other specimens; the hypanthium is densely pubescent with antrorse somewhat appressed hairs and the lobes are practically glabrous. Usually associated with glabrous lobes is a sparsely pubescent hypanthium, but here it appears as if this dense covering abruptly stopped at the lobes. This may be a significant character or it may be only a striking atypical phase. The whole plant is densely hirsute-villous, in habit very like Pennell's *8883* (villous form). Possibly it is a new species.

23. **A. Sprucei,** spec. nov., perennis: caulibus 1–3 dm. longis decumbentibus ramosis ad nodos non rare radicantibus patenter hirsutissimis, ramis ca. 1 dm. altis foliosis, internodiis 0.5–1.5 cm. longis: foliis radicalibus 3–5-fidis petiolatis (petiolo ca. 1 cm. longo), laciniis ca. 1 cm. longis obovatis inciso-dentatis coriaceis crassis supra sparse pilosis depresse nervatis subtus dense hirsuto-sericeis margine plus minusve revolutis: foliis caulinis radicalibus similibus sed trifidis paullo minoribus et sessilibus; stipulis vaginantibus multifidis, laciniis ca. 5–8 mm. longis ascendentibus foliaceis coriaceis subtus hirsuto-sericeis lineari-oblongis obtusiusculis margine plus minusve revolutis: floribus ad apices ramorum in glomerulos bracteatos aggregatis breviter pedicellatis villosis 2.5–3 mm. longis: hypanthio

campanulato 1.5–1.75 mm. longo; laciniis 1–1.25 mm. longis, exterioribus lanceolatis, interioribus ovatis: filamentis saepe 4 ca. 0.5 mm. longis: carpellis 5–6; acheniis 3–4, stylo longe exserto, stigmate subclavato.

ECUADOR: deeply rooting amongst rocks, Tungurahua, ca. 4000 m. alt., *Spruce 6102* (K, TYPE; G, phot.); Andes of Ecuador, ca. 3600 m. alt., *Pearce* in part (K).

The comparatively short-petiolate basal leaves, the numerous stem-leaves and the more or less approximate remnants of sheaths on the lower stems call to mind the *Nivales*. Quite as significant as the other features is the development of the stipules; these are vaginant and deeply cleft into linear obtusish or acutish lobes with revolute margins and are almost as long as the leaf-segments. In the specimens at hand the leaves are 3–5-cleft and appear strikingly coriaceous from the upper surface, the lower is more or less covered with the tiny bulbous bases which the hairs develop. The inflorescence is profuse with flowers large, firm in texture and densely villous; the disk nearly fills the throat of the hypanthium, the filaments are long and frequently four in number, and the styles are much exserted. On the whole a coarse more or less hirsute-villous plant with the habit of *A. venusta*, yet in many respects resembling the *Nivales*.

24. **A. Purdiei**, spec. nov., perennis: caulibus tenuibus prostratis frequenter ad nodos radicantibus, ramosis diffusis: foliis radicalibus brevi-petiolatis parvis, lamina trifida 0.5–1 cm. lata orbiculari-reniformi utrinque villosa: foliis caulinis sessilibus utrinque villosis trifidis, 1–3-dentatis sursum decrescentibus laciniis paucioribus, foliis superioribus cum stipulis haud rare conformibus vaginanti-amplexicaulibus, laciniis aequalibus verticillum mentientibus: floribus ad apices brevium ramorum glomerulatis brevi-pedicellatis villosis: hypanthio 1.75–2 mm. longo globoso-urceolato; laciniis 1 mm. longis acutis, exterioribus lineari-lanceolatis subaequalibus vel leviter quam interiores lanceolatae brevioribus: filamentis ca. 0.5–0.75 mm. longis: carpellis 5, stigmate subclavato.

COLOMBIA: Saint Sebastian, Nevada de Santa Marta, July 1844, *Purdie* in part (K, TYPE; G, phot.); Paramo de las Coloradas, above La Baja, Dept. Santander, 3900–4100 m. alt., *Killip & Smith 18,438* (G); paramos above Bogotá, 3500 m. alt., *Dawe 149* (K); St. Fé de Bogotá, *Purdie* (G).

The following collections have less dense and perhaps slightly coarser pubescence, smaller flowers (2–2.5 mm. long) and fewer (1–3) achenes: Paramo de las Vegas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 15,620* in part (G); moist paramo, Paramo de Choachi, near Bogotá, 3100–3300 m. alt., *Pennell 2246* (G, US); grassy paramo, "Llano de Paletara," Dept. El Cauca, 2950–3100 m. alt., *Pennell 6917* (G, US).

A. Purdiei is another example of the transition from the *Aphanoides* to the *Nivales*. Possibly close association of different species has resulted in hybrid-forms. Pennell's *6917* cited above, with data similar to those of Pennell's *6916* (*A. galioides*), is a good illustration of this. Although the collection is not sufficiently characteristic to be named *A. galioides*, a large portion of the flowers have a glabrous hypanthium, an outstanding feature of the species just mentioned. Furthermore, it is interesting to observe the gradual change from a decumbent to a prostrate habit.

Two collections may here be noted as close relatives but scarcely conspecific: Paramo de Timotes, Táchira, Venezuela, 3000–3500 m. alt., *Jahn 58* (US); Paramo de Mogotocoro, near Vetas, Dept. Santander, Colombia, 3700–3800 m. alt., *Killip & Smith 17,631* in part (G). In Jahn's specimen the pubescence is exceedingly fine much like that of typical *A. aphanoides* and the flowers are often completely glabrate, the prominent stipules and the inconspicuous stem-leaves, however, suggest the *Nivales*. The flowers of the Colombian collection are glabrous and might easily belong to *A. aphanoides*, but the sessile leaf-segments are not perceptibly longer than the stipular lobes, and both are more or less dentate and spreading, the leafy branches also simulate those of the *Nivales*.

25. **A. holosericea**, spec. nov., perennis: caulibus tenuibus (0.5–1 mm. diametro) prostratis ad nodos radicantibus ramosis, ramis ca. 1–2 cm. altis ascendentibus vel suberectis foliosis: foliis ca. 3 mm. longis trifidis sessilibus, laciniis linearibus utrinque dense sericeo-villosis margine revolutis; stipulis multifidis vaginantibus, laciniis ascendentibus ca. 2–2.5 mm. longis linearibus acutis utrinque sericeis margine revolutis: floribus axillaribus et solitariis vel ad apices ramorum plus minusve glomerulatis pedicellatis (pedicellis 1–2 mm. longis villosis) sericeis: hypanthio 1.5–2 mm. longo campanulato adpresso-villoso; laciniis ca. 1 mm. longis acutis, exterioribus linearibus vel lineari-lanceolatis ad apices versus incrassatis longioribus quam interiores lanceolato-ovatae: filamentis 2–3 ca. 0.5 mm. longis: carpellis 5–10 longe stipitatis; stigmate clavato.—Colombia to Peru.

COLOMBIA: shrub-forest on slope, Paramo del Quindio, Dept. Caldas, 4200–4400 m. alt., *Pennell & Hazen 9906* (G, US); Paramo de Ruiz, *Purdie* (K).
ECUADOR: without locality, *Jameson 20* (K).
PERU: patches in moss, Tambo de Vaca, ca. 3900 m. alt., *Macbride 4398* (F; US, TYPE).

This prostrate little plant is quite distinctive. Its branches are clothed with imbricated tiny silvery leaves which are sessile and trifid or tripartite; the entire segments with their revolute margins

and the lobes of the vaginant stipules closely resemble each other simulating a verticil, a foliar condition approaching that of the *Nivales* which differ only in that the leaves no longer retain their identity as such, but are a part of the equal-lobed foliar sheaths. The flowers of *A. holosericea* are either axillary and solitary or loosely glomerulate at the apices of the short branches, and although large (3 mm. long) are most inconspicuous probably on account of the erect or connivent hypanthium-lobes and the dense pubescence uniformly distributed over the entire plant. The bractlets are usually longer than the sepals and variable in number, some floral dissections revealing as many as seven. Another interesting and more significant feature, however, is their tendency to become slightly thickened toward the tip, the ribs under high magnification appearing clavate; the latter trait is characteristic of the *Nivales* rather than the *Aphanoides*. In truth only after much hesitancy has this species been included in the *Aphanoides*.

26. **A. sandiensis** Pilger. A dwarf perennial, stoloniferous: stems ca. 2–4 cm. long, decumbent, sparingly villous: basal leaves sparsely pilose, orbicular-ovate, slightly fleshy, tripartite; terminal segment 6–8-lobed, lateral segments 4–5-lobed; lobes oblong, obtusish or acutish; petioles 6–10 mm. long; stipules irregularly ovate, sparsely ciliate, membranaceous: cauline leaves subsessile, tripartite; stipules vaginant, 2–4-lobed, leaf-like in texture: floral branches short (ca. 1 cm. long) with leaves reduced in size and number of lobes: flowers 1.5–2 mm. long; hypanthium turbinate, appressed-pubescent; lobes glabrate, the bractlets as long as but much narrower than the ovate sepals: filaments ca. half the length of the sepals: pistils 1 or 2; stigma subclavate.—Pilger in Engler, Bot. Jahrb. xxxvii. 537 (1906).

PERU: between Poto and Ananea, Sandio, 4400–4500 m. alt., *Weberbauer 945* (Bot. Mus. Berlin-Dahlem, TYPE; G, fragm.).

This plant bears a slight resemblance to *A. Mandoniana* on account of the general texture of the leaves and the short floral branches. It represents a stage of transition toward the *Pinnatae*, if the general habit and lobing of the leaves may be accepted as criteria of the various groups. In comparison with the other members of the section *Lachemilla* the flower is not unduly small, the remaining parts of the plant however are strikingly dwarfed. The above description is compiled chiefly from the original.

27. **A. repens** Presl. A perennial with branching repent stems: basal leaves several, rosulate, tripartite with the segments pinnatifid-multifid; blades deltoid, 1 cm. long, 1.2 cm. wide, both surfaces spread-

ing-hirsute or the upper glabrate; petioles ca. 2 cm. long, more or less hirsute; stipules membranaceous, linear-lanceolate, entire: upper leaves smaller and subsessile or sessile, tripartite with the segments deeply incised or lobed; stipules 2–4-fid, leaf-like in texture, vaginant: ultimate segments of the leaves linear and obtusish: inflorescence glomerulate on short ascending lateral branches: pedicels very short and hirsute: hypanthium appressed-pilose, urceolate, ca. 1.25 mm. long; lobes glabrate, the sepals 0.5 mm. long, lance-ovate and acute, the bractlets much shorter and lanceolate: filaments ca. one-half to three-fourths the length of the sepals: achenes 2 or 1; stigmas clavate.—Epim. Bot. 199 (1849).

PERU: *Haenke* (G); open rocky slope, Huaros, Dept. Lima, 3300–3500 m. alt., *Pennell 14,716* (G).

The somewhat fragmentary specimen of Haenke is probably an isotype of *A. repens*. Pennell's specimen appears to be conspecific, differing only in its nearly or quite glabrous flowers.

Possibly this species is another member of the *Aphanoides* which points the way toward the *Pinnatae*. The similarity between the primary divisions of the basal leaves of *A. repens* and *A. erodiifolia* is striking, although the flower of *A. repens* resembles more closely the *Aphanoides* in the glabrate hypanthium-lobes and their relative length.

28. **A. Rusbyi**, spec. nov., perennis pusilla: caulibus tenuibus ca. 0.5 mm. diametro decumbentibus vel ascendentibus ramosis; ramis ca. 3–5 cm. altis ascendentibus foliosis hirsutis: foliis radicalibus parvis, lamina ca. 7 mm. lata orbiculari-ovata subtus hirsuta supra glabra tripartita, laciniis 3–7-fidis, lobulis oblongo-linearibus obtusiusculis; petiolo ca. 5–10 mm. longo hirsuto; stipulis membranaceis lanceolatis hirsutissimis: foliis caulinis sessilibus cum stipulis vaginas amplexicaules formantibus, laciniis ca. 2 mm. longis linearibus inaequalibus obtusis subtus pubescentibus: floribus axillaribus solitariis 1.75–2 mm. longis glabris breviter pedicellatis: hypanthio ca. 1.25 mm. longo urceolato; laciniis 4 ca. 0.5 mm. longis orbiculari-ovatis obtusis erectis vel conniventibus: filamentis ca. 0.3 mm. longis: carpello 1, stigmate subclavato.

BOLIVIA: Sorata, ca. 4000 m. alt., *Rusby 1855* (NY, TYPE; US).

A peculiar little plant not more than 5 cm. high with slender branching stems, in general habit closest to the *Aphanoides*. The stem-leaves in some measure approach the foliar condition typical of the *Nivales* but the sheath is amplexicaul rather than vaginant and the internodes are considerably longer than those of the *Nivales*.

The flowers might easily be confused with those of *A. Mandoniana* which they resemble in contour, glabrous quality and lack of bractlets. Strangely enough neither in habit nor in foliar characters is there any other similarity between the two species. Out of the forty known species of *Alchemilla* this is the third lacking an epicalyx.

Series IV. **Nivales.** Herbs with erect or decumbent stems: basal leaves 3–5-lobed or -cleft: stem-leaves as such replaced by foliar sheaths with 4–15 usually equal lobes: achenes commonly very obtusely ovoid; stigmas subglobose to clavate: hypanthium-lobes tending to be slightly thickened at the tips. Species 29–35.

Key to Species

Outer surface of leaf-sheaths conspicuously pubescent; lobes 4–15
  Sheath-lobes widely spreading to abruptly reflexed
    Hypanthium-lobes connivent, the bractlets usually a little shorter than the sepals
      Plant copiously hirsute: hypanthium glabrous.....29. *A. galioides*
      Plant sparsely pubescent with short rigid hairs: hypanthium glabrous or pubescent.....30. *A. hispidula*
    Hypanthium-lobes divergent and equal in length: plant villous: hypanthium villous.....31. *A. verticillata*
  Sheath-lobes laxly ascending to erect
    Leaf-sheaths (those of the middle of the stem) 4–6 mm. in diameter (measured immediately below the attachment of the lobes); lobes 6–15: hypanthium-lobes acute or slightly acuminate: plant villous
      Sheath-lobes 6–8, linear-lanceolate to lanceolate, adjacent whorls strikingly imbricated: flower ca. 3 mm. long: hypanthium-lobes erect, slightly acuminate.....32. *A. ocreata*
      Sheath-lobes 10–15, linear to lance-linear, slightly if at all imbricated: flower ca. 2.5 mm. long: hypanthium-lobes usually connivent, acute.....33. *A. nivalis*
    Leaf-sheaths similarly measured ca. 2 mm. in diameter; lobes 4–6: hypanthium-lobes obtusish: plant hispidulous.....34. *A. ericoides*
Outer surface of leaf-sheaths glabrous or puberulent; lobes 4–6 ..... 35. *A. equisetiformis*

29. **A. galioides** Benth. Perennial: stems densely hirsute, ascending or decumbent, profusely branching: branches erect or ascending: basal leaves petiolate; blade small, 3–5-fid; stipules membranaceous, very hirsute: leaf-sheaths although numerous not concealing the stems nor the branches; sheath-lobes 8–10, commonly twice as long as the body of the sheath, lanceolate, at first loosely-ascending, later reflexed, glabrous or sparingly hirsute above, hirsute beneath, margins entire, revolute: inflorescence glomerulate, axillary and terminal on stems and short laterals: flowers short-pedicelled: hypanthium 1–1.5 mm. long, globose-urceolate, glabrous; lobes 8(–10), hirsute, sepals 0.75–1 mm. long, broadly ovate, acutish; bractlets

lanceolate, usually shorter than the sepals: achenes 2–5; stigma subclavate to subglobose.—Pl. Hartweg. 134 (1844).

COLOMBIA: Paramo de Mogotocoro, near Vetas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 17,621* (G); dry grassy paramo, Cerro Tatama, Dept. Caldas, 3400–3700 m. alt., *Pennell 10,562* (G, US); grassy paramo, "Llano de Paletara," Dept. El Cauca, 2950–3000 m. alt., *Pennell 6916* (G, US).

ECUADOR: among bunches of grass, paramos ca. 7.5 km. west of Tulcan, 3300 m. alt., *Hitchcock 20,917* (G, US); Andes of Quito, 3500–4000 m. alt., *Jameson* (G, US); in continuous snow, Pichincha, 4600 m. alt., *André 3860* (G); Mt. Cayambe, *Jameson 506* (G); Carguairago. *Spruce 5496* in part (K); Surucucho, near Cuenca, *Jameson 65* (K); in bogs on the Cordillera near Condoruru, Loxa, *Hartweg 750* (K, TYPE; phot. G); Andes of Ecuador, ca. 3000 m. alt., *Pearce* in part (K).

PERU: Andes of Puitac, ca. 3000–3500 m. alt., Feb. 1867, *Pearce* (K).

The following collections are at least not typical: *Killip & Smith 17,621*, *André 3860*, *Jameson 506*, and *Spruce 5496* in part. These small more or less prostrate plants have pubescent hypanthia and exhibit a very strong tendency to develop trifid stem-leaves.

In the *Aphanoides*, attention has already been called to three species probably representing transitional stages between that group and the *Nivales*. *A. galioides* is more closely allied to the latter in habit, prevailing foliar characters and inflorescence; although, the more or less persistent basal leaves, the occasionally trifid stem-leaves and the slightly narrowed apices of the achenes also indicate its relation to the former series. The conspicuous characters of the species are the long, rather coarse and spreading pubescence, the reflexed lobes of the leaf-sheaths and the glabrous hypanthia.

30. **A. hispidula,** spec. nov., perennis: caulibus caespitosis decumbentibus vel erectis subsimplicibus vel supra ramosis foliosis 1–3 dm. longis; ramis brevibus (1–5 cm. longis) approximatis simplicibus: foliis radicalibus 3–5-fidis parvis petiolatis inconspicuis: foliis caulinis cum stipulis connatis conformibus vaginanti-amplexicaulibus externe hispidulis supra glabratis vel glabris, laciniis 8–12 aequalibus linearibus obtusiusculis laxe ascendentibus vel maturitate reflexis margine integris et revolutis: floribus ad apices ramulorum glomerulatis breviter pedicellatis vel subsessilibus plus minusve pubescentibus: hypanthio ca. 1.25 mm. longo globoso-urceolato; laciniis ca. 1 mm. longis acutis, exterioribus paullo quam interiores ovatae brevioribus et angustioribus: filamentis brevibus: carpellis 3–5, stigmate clavato.

COLOMBIA: Paramo de Romeral, Dept. Norte de Santander, 3800–4200 m. alt., *Killip & Smith 18,642* (G); Paramo de Ruiz, Dept. Tolima, 3500–4000 m. alt., *Pennell 3016* (G, US); Paramo de Ruiz, Cauca, 3300–4200 m. alt., *Lehmann 3100* (US); without locality, *Purdie* (K), *Seemann* in part (K), *Jameson 898* (K).

ECUADOR: swampy outlet of the "laguna de Mica" near the farmhouse of

Antisana, ca. 3900 m. alt., *Hartweg 969* (K); near the limit of perpetual snow, Quitensian Andes, Jan. 21, 1856, *Jameson 437* (G, TYPE), 1855, *Couthouy* (G); Andes of Ecuador, 1857–9, *Spruce 5496* (G, K in part).

This species with linear sheath-lobes, globose hypanthium and connivent hypanthium-lobes recalls *A. nivalis;* it differs, however, in having a more or less sprawling habit, slender branches, laxly spreading sheath-lobes and coarse pubescence. Another nearly allied species is *A. galioides* which it resembles slightly in the position or the divergent angle of the sheath-lobes and in the floral characters. Quite different from that of either relative is the pubescence of short somewhat appressed bristly hairs sparsely investing all except the floral parts where the pubescence is finer and most variable in quantity always covering the hypanthium-lobes and at times the entire flower. Apart from the amount of pubescence the flowers of the three species above mentioned are very similar.

31. **A. verticillata** Fielding & Gardner. A softly villous perennial: stems leafy, decumbent, profusely branching: branches ascending or suberect: basal leaves not seen: leaf-sheaths villous, at times not concealing the stems but those of the branches imbricated; lobes of the sheath 8–10, approximately twice the length of the body of the sheath and usually a little longer than the internodes, equal, widely spreading or acutely reflexed, lanceolate or linear-lanceolate, acutish, nearly glabrous and brownish above, somewhat sericeous-villous beneath, margins revolute: inflorescence of glomerules at the apices of the branches or on short laterals (1 cm. long): flowers densely sericeous, short-pedicelled, in small clusters surrounded by involucral sheaths: hypanthium urceolate; lobes usually equal in length, divergent, obtusish; bractlets lance-ovate, sepals ovate: filaments ca. half the length of the sepals: achenes 2–4, stipitate; stigmas subclavate. —Sertum Plantarum tab. lxv. (1844). *A. lycopodioides* Trev. Bot. Zeit. vii. 215 (1849). *A. galioides, β sericea* Wedd. Chloris Andina ii. 248 (1861).—Colombia and Venezuela.

COLOMBIA: Paramo de Santurban, near Vetas, Dept. Santander, 3950–4160 m. alt., *Killip & Smith 17,483* (G); Cruz Verde, *Holton 934* (G); El Chorro, *Holton 935* (K).

VENEZUELA: Caracas, *Linden 442* (K, ISOTYPE; G, fragm.); Paramo del Jabón, Trujillo, 3000–3200 m. alt., *Jahn 77* (US); Paramo Pan de Azucar, Michuntui, 4000 m. alt., *Jahn 57* (US); Paramo de Timotes, Mérida, 4000 m. alt., *Jahn 548* (US); Paramo Quirora, Mérida, 3200 m. alt., *Jahn 733* (US).

This species closely resembles *A. galioides* in the lax habit and the spreading or reflexed lobes of the leaf-sheath, but is readily separated by the villous pubescence and floral characters. The flowers of

A. verticillata are sericeous-villous, the hypanthium is longer than broad and the lobes are of equal length with the bractlets only slightly narrower than the sepals.

32. **A. ocreata** Donn. Smith. A softly villous perennial: stems decumbent with branches ascending or suberect and profusely leafy: basal leaves very small, petiolate, incised-dentate: leaf-sheaths imbricated; lobes of the sheath 6–8, at least one-half longer than the body of the sheath, ascending-spreading but not at all reflexed, strongly imbricated, lanceolate, obtusish, equal, sparingly villous above, densely sericeous below, margins revolute: inflorescence glomerulate and terminal: flowers densely villous, short-pedicelled or subsessile: hypanthium campanulate, 2 mm. long; lobes 1 mm.. long, acute or slightly acuminate; the bractlets lanceolate, the sepals ovate: filaments ca. half the length of the sepals: achenes 4(–8); stigmas subclavate.—Bot. Gaz. xxiii. 7 (1897). *Lachemilla ocreata* Rydb. North Amer. Fl. xxii. 385 (1908).

Costa Rica: thickets at General, 600 m. alt., Jan. 1891, *Pittier 3431* (US, type); Buena Vista, 3100 m. alt., Jan. 19, 1891, *Pittier 3431* (G).

This is a very close relative of *A. verticillata* from which it may be distinguished by the large flowers with slightly acuminate hypanthium-lobes and the imbricated loosely ascending segments of the leaf-sheaths. In the second character this species somewhat resembles *A. nivalis*, but the leaf-sheaths of the latter have linear to lance-linear lobes, the flowers are usually not more than 2.5 mm. long, the hypanthium-lobes are connivent, and the general habit is not so lax as that of *A. ocreata*. An inconspicuous creeper not reported since the collection of Pittier.

33. **A. nivalis** HBK. A cespitose perennial: stems ascending or decumbent, subsimple or branched toward the apex: basal leaves petiolate, small, 3–5-incised-dentate; stipules membranaceous: leaf-sheaths imbricated, concealing both stems and branches, about halfway up the stem at the line of attachment of body and lobes 4–6 mm. in diameter; lobes 10–15, about the length of the body, erect or only slightly spreading, approximate or at the apices of the branches imbricated, linear to lance-linear, obtusish, equal, appressed-villous or glabrescent above, densely silky or canescent-villous beneath, margins revolute: inflorescence of compact glomerules at the apices of stems and branches or on short laterals: flowers very short-pedicelled or subsessile, villous, in twos or threes surrounded by involucral sheaths: hypanthium 1.5 mm. long, subglobose-urceolate with 8(–10) connivent lobes; bractlets lanceolate or linear-lanceolate, equalling

or shorter than the ovate acutish sepals: filaments usually half the length of the sepals: pistils 2–5, stigmas subclavate.—Nov. Gen. et Spec. vi. 223 (1824).—Colombia to Peru.

COLOMBIA: Paramo de Herveo, Prov. Antioquia, 3400 m. alt., *Triana 4205* (US); Paramo de Guasca, *Ariste-Joseph A440* (US); dry grassy paramo, Cruz Verde near Bogotá, Dept. Cundinamarca, 3300–3600 m. alt., *Pennell 2084* (G, US); moist paramo near Laguna Verjon, Paramo de Choachi near Bogotá, 3200–3400 m. alt., *Pennell 2232* (G, US); grassy slopes, Paramo del Quindio, Dept. Caldas, 4300–4500 m. alt., *Pennell & Hazen 9898* (G, US); dry open, Paramo de Ruiz, Dept. Tolima, 3500–4000 m. alt., *Pennell 3025* (G, US); Paramo de Buena Vista, Huila group, Central Cordillera, Cauca, 3000–3600 m. alt., *Pittier 1143* (US); Paramo de Moras between Mozoco and Pitayó, Tierra Adentro, 3000–3500 m. alt., Feb. 1906, *Pittier 1726* (US, *531,756*); Paramo de Guanacas, Popayan, 3000–3500 m. alt., *Lehmann 4889* (K); Paramo Las Delicias, Central Andes of Popayan, 3500–4000 m. alt., *Lehmann B. T. 665* (NY); Azufral, Cauca, *André K.497* (G); Paramo de Tuquerres, Pasto, 3500 m. alt., *Triana* (K); *Seemann* (K).

ECUADOR: Paramo de Tusa, between Tusa and Ibarra, *Lehmann 4992* (K); Pichincha, ca. 3500 m. alt., *Hall 22* (K), 1855, *Couthouy* (G); in sterile soil on the southwest rim of the crater Guagua-Pichincha, 4500 m. alt., *Lehmann 401* (G); near the summit of Pichincha, Corazon, Cayambe and other high mountains, *Jameson* (K); from the snowy summit of the Andes, *Jameson* (US, *534,756*); summit of Andes (probably *Jameson*) *46* (K).

PERU: in damp places on high mountains, Portachuela, July, *Mathews 1149* (K); without locality, *Herb. R. & P.* (K), *McLean* (K).

The stout stems, the erect or only slightly spreading lobes of the leaf-sheaths and the villosity of fine long straight hairs are the best characters of this species. The inflorescence is usually villous, but the collections of *Pennell & Hazen 9898*, *Pennell 3025*, and *Jameson* (K, with data: "found near the summit of Pichincha, Corazon, Cayambe and other high mountains") have flowers with a glabrous hypanthium. A rather striking form presents itself in the following: *Hall 22*, *Triana 4205*, *Pittier 1143*, *1726*, and *Ariste-Joseph A440*. These are all larger than the typical and silvery with exceedingly long fine hairs. At times this villosity appears matted or floccose as if the plants had been collected in wet places.

34. **A. ericoides**, spec. nov., perennis: caulibus tenuibus erectis vel decumbentibus supra ramosis, ramis undique foliosis ascendentibus vel suberectis approximatis simplicibus: foliis radicalibus non visis: foliis caulinis cum stipulis connatis conformibus vaginanti-amplexicaulibus externe hispidulis; laciniis 4–6 aequalibus linearibus obtusis coriaceis approximatis non imbricatis plerumque vagina duplo longioribus patenti-erectis externe strigosis supra glabriusculis margine integris et revolutis ad apicem versus paullo incurvatis: floribus ad apices ramulorum glomerulatis brevissime pedicellatis hispidulis: hypanthio 1 mm. longo turbinato; laciniis 1 mm. longis

oblongo-ovatis crassis obtusiusculis patentibus, 4 exterioribus 4 interioribus subaequalibus: carpello 1, stigmate subgloboso.

COLOMBIA: Nevada de Santa Marta, 3500 m. alt., *Purdie* (TYPE, K; phot., G).

This curious little plant is 10–14 cm. high with stems about 1 mm. in diameter. The hairs of the pubescence are short, coarse, stiff and appressed, under high magnification resembling little quills, those which clothe the flowers being scarcely finer than those on the main axis of the plant. The slightly fleshy hypanthium-lobes are ovate-oblong, obtusish and about as long as the calyx-tube. The spreading-erect lobes of the leaf-sheaths converge toward the apices, which appear to be grayish in color. The last feature is probably an individual phase rather than a specific character.

35. **A. equisetiformis** Trev. A cespitose perennial: stems slender, 3–4 mm. in diameter, erect or ascending, branching: leaf-sheaths imbricated concealing both stems and branches, the outer surface reticulate-veined, except at the very base downy quickly becoming glabrous, the inner densely pilose or villous; lobes 4–6, about one-third the length of the body of the sheath, erect, elongated-triangular, obtusish, equal, margins strongly revolute and glabrous: inflorescence of compact glomerules at the apices of the stems and branches or short laterals: flowers very short-pedicelled, downy, in clusters of two or three surrounded by involucral sheaths: hypanthium turbinate-campanulate; throat very slightly if at all constricted by the annular disk; bractlets lanceolate, obtusish, shorter than the oblong-ovate obtuse and slightly cucullate sepals: filaments very short: achene 1; stigma subclavate.—Bot. Zeit. vii. 216 (1849). *A. stemmatophylla* Wedd. Chloris Andina ii. 248, pl. 75 B (1861).—Colombia and Venezuela.

COLOMBIA: swales, Paramo del Quindio, Dept. Caldas, 3700–4200 m. alt. *Pennell & Hazen 9982* (G, US).

VENEZUELA: Sierra Nevada de Mérida, *Linden 1614* (TYPE, not seen by the writer), 2500–4000 m. alt., *de Bellard 247* (US), 3000–4000 m. alt., *Jahn 55* (US).

A clear-cut species readily recognized by the slender stems and branches, the long leaf-sheaths and proportionally short lobes, the glabrous reticulate outer surface, and the pubescence protruding along the margins of the sinuses.

Series V. **Pinnatae.** Herbs with repent or decumbent stems: basal leaves pinnate or bipinnatifid: inflorescence glomerulate and terminal or flowers solitary and axillary. Species 36–40.

Key to Species

Basal leaves bipinnatifid: cauline leaves bipinnatifid or pinnate to tripartite
  Calyx-bractlets well developed almost or quite equalling the sepals in length: flowers usually short-pedicelled
    Primary segments of the basal leaves bipartite or bifid: pinnules 1–3-lobed: stipules of the cauline leaves leaf-like in texture: flowers villous to glabrate: achenes 1–2: plant villous to pilose: habit not dense
      Blades of basal leaves ovate, 1.5–2 times as long as broad: pinnae few (3–6 pairs) and not crowded: hypanthium-lobes ciliate, the outer lanceolate and slightly narrower than the inner lance-ovate ones...36. *A. bipinnatifida*
      Blades of the basal leaves linear-oblong, at least three times as long as broad: pinnae numerous (8–15 pairs) with the margins overlapping: hypanthium-lobes ovate.....37. *A. pinnata*
    Primary segments of the basal leaves bipinnatifid: all stipules membranaceous, golden-brown: flowers hirsute-villous: achenes 2–3: plant hirsute-villous: habit dense
      38. *A. erodiifolia*
  Calyx-bractlets wanting or much reduced and obscure: sepals 4–5: the lowest flowers on very long pedicels (3–10 mm.)
    39. *A. Mandoniana*
Basal leaves pinnate: upper leaves digitately tripartite.....40. *A. barbata*

36. **A. bipinnatifida**, spec. nov., perennis plus minusve pilosa: caulibus prostratis diffusis ramosis rariter ad nodos radicantibus: foliis radicalibus bipinnatifidis; petiolo 1–2.5 cm. longo; lamina ovata-oblonga 1–2.5 cm. longa 0.75–1.5 cm. lata, pinnis inaequaliter bifidis vel bipartitis, pinnulis 1–3-lobatis; stipulis integris membranaceis ovatis acutis ciliatis: foliis caulinis pinnatifidis pinnatisve sessilibus, segmentis 1–3-lobatis; superioribus tripartitis, terminalibus segmentis 3–7-lobatis; stipulis viridibus foliaceis pluri-lobatis connatis vaginantibus: glomerulis axillaribus et terminalibus in caulibus et brevibus ramis; floribus pedicellatis pilosis vel glabratis: hypanthio urceolato; laciniis parce ciliatis acutis, exterioribus lineari-lanceolatis, interioribus ovatis: carpellis 1–2, stigmate globoso.

Bolivia: La Paz, 3800 m. alt., March, 1913, *Buchtien* (G, type), *Buchtien 6172* (US); Insel Coaty (Moon Island) in Lake Titicaca, 3840 m. alt., March 1910, *Buchtien 2864* in part (US), *Buchtien (2864)360* (G).
Argentina: Santa Rosa, Dept. Chicligasta, 3600 m. alt., *Venturi 3181* (G).

It is with much hesitation that Venturi's *3181* has been referred to this species; its habit is not so diffuse as that of the type, rather resembling that of *A. pinnata*, but the broadly ovate basal leaves and the ciliate hypanthium-lobes of the flower indicate a closer relation to *A. bipinnatifida.*

Two characteristics are almost constant in the *Pinnatae:* the

flowers are solitary in the axils of the leaves and the stems are usually simple and repent. *A. bipinnatifida* differs in having axillary glomerules and diffusely branching decumbent stems. In these respects it closely simulates the *Aphanoides*, yet it seems impossible to place it there on account of its pinnate leaves. Possibly it is a connecting link between the two groups.

37. **A. pinnata** R. & P. A softly villous repent perennial: basal leaves bipinnatifid; petioles 0.5–3.5 cm. long, villous; blades linear-oblong, 1.5–6 cm. long, 0.5–1.5 cm. wide (at least three times as long as broad); pinnae numerous (8–15 pairs) with margins usually overlapping, unequally 2-cleft or 2-parted; pinnules 3–7 mm. long and 1–3-lobed; stipules chartaceous, ciliate, lanceolate or lance-ovate, entire: upper leaves pinnate or the uppermost tripartite, subsessile; stipules many-lobed, vaginant, leaf-like in texture: ultimate segments of the leaves obovate, obtusish, villous or somewhat glabrate beneath, more or less pilose above: flowers solitary and axillary or in terminal glomerules on short ascending usually simple lateral branches: pedicels 2–5(–10) mm. long: hypanthium villous to glabrate; lobes green or yellowish tinged, lance-ovate, obtusish or acute, subequal: achenes 1 or 2; stigma subclavate.—Fl. Peruv. i. 69 (1798); DC. Prodr. ii. 590 (1825); Remy, Ann. Sci. Nat. ser. 3, vi. 354 (1846); Griseb. Goett. Abh. xix. [Pl. Lorentz. 89] 137 (1874); Fries, Nova Acta Reg. Soc. Sci. Upsal. ser. 4, i. 141 (1905). *A. achilleaefolia* Remy, l. c. viii. 224 (1847). *A. alata* R. & P. ex Steud. Nom. Bot. ed. 2, i. 47 (1840). *Aphanes pinnata* Pers. Syn. Pl. i. 150 (1805). *Aphanes alata* Steud. l. c. ed. 1, 58 (1821). *Zygalchemilla pinnata* Rydb. North Amer. Fl. xxii. 385 (1908).—**On high mountains from Mexico to northern Argentina.**

MEXICO: moist soil in the bottom of the crater, Nevada de Toluca, ca. 4050 m. alt., *Pringle 4228* (G, US); Ixtaccihuatl, 1903, *Purpus* (G), *Purpus 86* (US), *Purpus 1769, 1683* (G, US).

COLOMBIA: Paramo de las Vegas, Dept. Santander, 3700–3800 m. alt., *Killip & Smith 15,622* (G); Paramo de las Coloradas, above La Baja, Dept. Santander, 3900–4100 m. alt., *Killip & Smith 18,411* (G).

PERU: vicinity of Baños, *Wilkes Exped.* (US, *653,926* and *43,798* in part); creeping in wet places, Oroya, above Lima, 3000–4200 m. alt., *Kalenborn 47* (G, US); above Casapalca (as Casapalta), 4200–4300 m. alt., April, 1882, *Ball* (G, K); Chilca, 3600–3900 m. alt., April, 1882, *Ball* (K); common on bunchgrass and upland slopes, Rio Blanco, 4500 m. alt., *Macbride & Featherstone 807* (F, US); moist grassy slope, La Raya, Dept. Cusco, 4300–4500 m. alt., *Pennell 13,527* (G); in wet places, Azangaro, *Lechler 1785.b* (K); ledges of limestone rock, Chuquibambilla, Dept. Puno, 3850–3900 m. alt., *Pennell 13,411* (F, G); Puno, April, 1902, *Oquendo 5bis* (K).

BOLIVIA: on marshy ground in the vicinity of Sorata, Prov. Larecaja, 3700 m. alt., *Mandon 667* (G); Unduavi, 3300 m. alt., Nov. 1910, *Buchtien 19* (G), 3200 m. alt., Feb. 12, 1907, *Buchtien 6173* (US); Chacaltaya, 4800 m. alt., Feb.

1908, *Buchtien 1760* (US); La Paz, *Williams 2341* (US), 3000 m. alt., *Bang 76, 659* and *Rusby 2551* (G, US), 3750 m. alt., *Buchtien 122* (G); Incachaca, Dept. Cochabamba, 2800 m. alt., *Steinbach 5880* (F); Tucumilla near Tarija, 2800 m. alt., *Fiebrig 2453* (G, US).

CHILE: Cord. Volcan Tacora, Ancara, Dept. Tacna, ca. 4300 m. alt., *Werdermann 1139* (F, G).

ARGENTINA: in wet places, Cangrejillos, Jujuy, ca. 3500 m. alt., Dec. 1901, *Fries 980* (US); La Cienega, Sierra de Tucumán, *Lorentz & Hieronymus 576* (F); Tucumán, *Lorentz* (K); La Ollada, 3100 m. alt., March 3, 1916, *Jörgensen 1292* (G); El Candolto, Dept. de Andalgalá, Feb. 2, 1917, *Jörgensen 1292* (US); Sierra Achala de Córdoba, Dec. 4, 1878, *Hieronymus* (K).

Readily distinguished by the foliar characters and the slender floral branches. The basal leaves are light-green and linear-oblong, entirely unlike those of any other member of this group, the striking features of the stem-leaves are their reduction to simply pinnate or tripartite forms and their many-lobed foliaceous stipules.

In this as in other species of *Alchemilla* the pubescence is exceedingly variable, ranging from densely to sparsely villous or even pilose. Weddell set apart a variety which he described "β. minima, foliis fere glabris" (*A. pinnata* var. *minima* Wedd. ex Griseb. l. c.). One collection, *Werdermann 1139*, suits this description, but the collection of *Rusby 2551* with very large plants has leaves almost glabrous, while the specimen collected by the Wilkes Expedition (US, *653,926*) is very small and densely villous. With the material at hand it is possible to arrange a perfect series of gradations as to size and pubescence; nevertheless, since these are not correlated it does not seem practicable at present to define either varieties or forms.

38. **A. erodiifolia** Wedd. A villous to hirsute-villous repent perennial: basal leaves bipinnatifid with the leaflets (5–7 pairs) pinnatifid; petioles 2.5–7.5 mm. long, villous; blades deltoid-ovate, 0.7–1.5 cm. long, 0.5–1 cm. wide, thickish, shaggy-villous to hirsute-villous below, somewhat glabrous above: upper leaves smaller and subsessile, pinnatifid with the segments merely lobed; stipules more or less appressed-villous, golden-brown, membranaceous, ovate, obtusish, entire or 2-cleft, connate, adnate to the petioles: inflorescence on short (1–2 cm. long) ascending branches: the villous flowers very short-pedicelled, axillary and terminal in loose glomerules: hypanthium urceolate; lobes usually of equal length, the outer lanceolate and slightly narrower than the inner ovate ones: achenes 2–3.—Chloris Andina ii. 247 (1861) including var. β *hirsuta*.—Colombia to Bolivia.

COLOMBIA: grassy slopes, Paramo del Quindio, Dept. Caldas, 4300–4500 m. alt. *Pennell & Hazen 9899* (G, US).

ECUADOR: without locality, Jan. 21, 1856, *Jameson 507* (G).

PERU: Lucumayo valley, 3600 m. alt., *Cook & Gilbert 1253* (*?5*) (US); grassy granitic slope, San José, ca. 4000 m. alt., *Macbride & Featherstone 1104* (F, US); Andes of the Central provinces, *Dombey* acc. to Wedd. l. c.; without locality, *Mathews* (K).

BOLIVIA: dry places of mountains above Sorata acc. to Wedd. l. c.

The dense habit, the thick dark-green leaves and the coarse copious pubescence are the outstanding characters of this plant. The stipules of the upper leaves are golden-brown and membranaceous, a feature approached only in *A. Mandoniana* and possibly shared by *A. barbata;* from the former it is readily distinguished by the presence of an epicalyx, while the latter has simply pinnate leaves. The flowers are very like those of its relative *A. pinnata.* It is a little hard to determine whether the material cited is genuine *A. erodiifolia* or Weddell's variety *hirsuta.* The original is described as having a glabrous hypanthium while all the flowers examined for the present work are villous. This discrepancy might be explained by the apparent tendency of the hypanthia of the flowers in the *Nivales* and the *Pinnatae* to become glabrous with age. The Colombian plants are a little smaller than the Peruvian material and the pubescence is slightly coarser with a tendency to be setose, yet there does not seem sufficient difference to warrant varietal separation.

A specimen collected by the Wilkes Expedition (US, *43,798* in part) is puzzling indeed. Possibly it is a glabrous form of *A. erodiifolia* which it resembles in habit and in the contour of its leaves. The flowers are slightly larger than those of *A. pinnata.*

39. **A. Mandoniana** Wedd. A slender essentially glabrous repent perennial: basal leaves bipinnatifid; petioles 2–5(–25) mm. long; blades deltoid-ovate, 5–10 mm. long, 3–8 mm. wide; pinnae few (2–3 pairs) and 2–5-cleft: cauline leaves very short-petioled or subsessile, pinnate; pinnae 2–5-cleft or simple: ultimate segments of the leaves linear-oblong to obovate, obtuse, glabrous, apex sparsely penicillate: stipules connate, adnate to the petiole, green, much thinner in texture than the leaves, lance-ovate, acute, simple or bifid, apex sparsely penicillate: inflorescence on short (1–2 cm. long) ascending branches: pedicels of the lower flowers commonly conspicuous, 3–10 mm. long, usually bearded immediately below the hypanthium, otherwise glabrous: flowers 2–2.5 mm. long, glabrous: bractlets absent or very much reduced; sepals 4 or 5, ovate, obtusish, connivent: achenes 1 or 2.—Chloris Andina ii. 246 (1861); Murbeck, Lunds Univ. Årsskr. N. F. Afd. 2. Bd. xi. Nr. 8: 12, fig. iv, 8–11 (1915).—Colombia, Ecuador and Bolivia.

COLOMBIA: edge of pond, Paramo del Quindio, Dept. Caldas, 3700–4200 m. alt., *Pennell & Hazen 9979* (G).

Ecuador: Quitensian Andes, 1855, *Couthouy* (G); grassy places on mount Mulmúl, 2850 m. alt., Nov. 1857, *Spruce 5133* (K); by banks of streams, Titaicum, Nov. 1858, *Spruce 5133* (K); Ecuadorian Andes, 1857–9, *Spruce 5133* (G, K).

Bolivia: at Lake Guarciana near Apacheta de Chuehu, in the neighborhood of Sorata, Prov. Larecaja, 4500 m. alt., Nov. 1856, *Mandon 666* (K).

So important a character did the absence of bractlets appear that Lagerheim defined a section *Fockella* for this particular species. However, following the description of *A. diplophylla* in Engler, Bot. Jahrb. xl. 277 (1908), Prof. Diels notes that he has examined the type specimen of *A. Mandoniana* in the Museum at Paris and points out that "dentes 4 exteriores (sepala) et petala 4 minuta adesse facile observatur." Although the specimens cited have only one series of hypanthium-lobes, yet if one may draw conclusions from the variation in other species, it seems logical that rudiments of a second series are to be expected.

This delicate slender trailing plant is at once set apart by the very small deltoid-ovate glabrous bipinnatifid basal leaves, the very short floriferous branches and the conspicuously long pedicels. A pubescent form with a dense habit appears in Ecuador:

Forma **pilosa**, forma nova, undique dense pilosa floribus glabris exceptis. Stems, leaves and pedicels densely pilose; flowers glabrous.

Ecuador: Pichincha, 4300 m. alt., July 3, 1876, *André K.496* (K, type); Antisana, *Jameson 69* (K).

In Jameson's *69* the surface of the leaves appears roughish on account of the fine bulbous bases which the hairs develop. Although the material lacks inflorescence, yet its characteristic habit undoubtedly places it in this species.

40. **A. barbata** Presl. A cespitose rigidulous perennial 1–3 cm. high: basal leaves pinnately 5-foliolate: cauline leaves digitately tripartite: pinnae 3–4 mm. long, 0.5–0.75 mm. wide, entire, linear to lance-linear, obtusish, glabrous or sparsely ciliate, apex barbate, under surface pale, midrib broad and green: stipules entire or slightly lacerate, scarious, ciliate, adnate to the petioles: flowers in capitate glomerules at the apices of stems and short ascending branches: pedicels hirsute: hypanthium ca. 2 mm. long, turbinate, glabrous; bractlets 0.5–0.75 mm. long, ovate, obtuse, barbate; sepals 1–1.5 mm. long, orbicular-ovate, slightly cucullate, barbate a little below the apex: achene 1, stipitate.—Epim. Bot. 199 (1849). *A. Weberbaueri* Pilger in Engler, Bot. Jahrb. xxxvii. 537 (1906).—Reported only from Peru.

PERU: Cordillera Negra between Ocros and Chonta, Cajatambo, Dept. Ancachs, 1903, *Weberbauer 2778* (Bot. Mus. Berlin-Dahlem, TYPE of *A. Weberbaueri;* G, fragm.); Andes of Huanta, 3900–4200 m. alt., 1867, *Pearce* (K).

A unique plant readily distinguished by its very low cespitose habit, glabrous or ciliate simple lance-linear leaflets, and conspicuous stipules on the flowering branches. A species sufficiently clear-cut to enable one to identify the cited specimens by Presl's description. The type was collected by Haenke on high mountains of Peru.

Series VI. **Diplophyllae.** Low herbs with creeping rhizomes: upper surface of the leaves appendaged on both sides of the midrib: flowers solitary and axillary. Species 41.

41. **A. diplophylla** Diels. A small plant 2–3.5 cm. high with creeping rhizomes: stem above ground very short (1–2 cm. high), roughened by leaf-scars and subpersistent petioles: leaves glabrous or the margins of the young leaves and their appendages sparsely pilose; blades cuneate-obovate 3–8 mm. long, 3–5 mm. wide, apex coarsely tridentate with the middle tooth smallest, appendaged along both sides of the midrib; appendages foliaceous, well-developed, almost covering the upper surface of the blade; petioles 1.5–2 cm. long, glabrous; stipules scarious, lanceolate, entire, apex ciliate: flowers axillary and solitary, almost entirely glabrous: peduncles 2 cm. long or less, below the middle bearing 2 keeled connate bracteoles; apices of the bracteoles free, cucullate; keels sometimes ciliate: hypanthium 1.5 mm. long; lobes 1.5 mm. long, 4, concave, rotund, apex slightly cucullate and occasionally very sparsely hairy: bractlets none: achene 1.—Diels in Engler, Bot. Jahrb. xl. 277 (1908). *A. appendiculata* Wedd. ex Murbeck, Lunds Univ. Årsskr. N. F. 2. Bd. xl. Nr. 8: 11, fig. iii; 12, fig. iv. 1–4 (1915).—Peru and Bolivia.

PERU: on the railway between Lima and Oroya near Yauli, 4400 m. alt., *Weberbauer 288* (TYPE; Bot. Mus. Berlin-Dahlem; fragm., G); in cushions of *Distichia* on wet moor, La Raya, Cusco, 4300–4500 m. alt., *Pennell 13,498* in part, *13,499* in part (G).

BOLIVIA: near Sorata, Prov. Larecaja, 3500–5000 m. alt., *Mandon 669* (G, K), *Mandon 669bis* (K).

Even if diminutive, this plant is very remarkable. The appendaged leaves and the bracteoliferous peduncle are characters not duplicated in any species of the section; although, another distinctive feature, the absence of an epicalyx, is shared by *A. Mandoniana* and *A. Rusbyi*. In view of the extreme differences in habit and foliar characters, however, the species does not appear to be closely related to any of the other known members of *Lachemilla*.

Unidentified Species, Varieties and Forms.

A. CALCHAQUINA Lillo, Prim. Reun. Nac. Soc. Argent. Cien. Nat. [Tucuman, 1916] 229 (1919). Very closely related to, if not identical with *A. pinnata*. The meagre description does not indicate the characters necessary to distinguish species.

A. GALIOIDES Trev. Bot. Zeit. vii. 215 (1849). Since the description of this species is not sufficiently clear-cut to apply with certainty to any of the collections seen during this study, it has been omitted from the discussion. The name is antedated by a valid homonym and therefore not important. The species might belong to the *Aphanoides* or possibly to the *Nivales*. A study of the type is necessary to establish its identity.

A. HIRSUTA HBK. Nov. Gen. et Spec. vi. 224 (1824). This is a member of that subgroup of the series *Aphanoides* in which, on account of the variability of characters, it is exceedingly difficult to define species; moreover, the type-locality is unknown. The result has been the application of the name *A. hirsuta* to many species differing not only in specific characters but also in geographic distribution. Only a study of the type will reveal the identity of this elusive and diversely interpreted species.

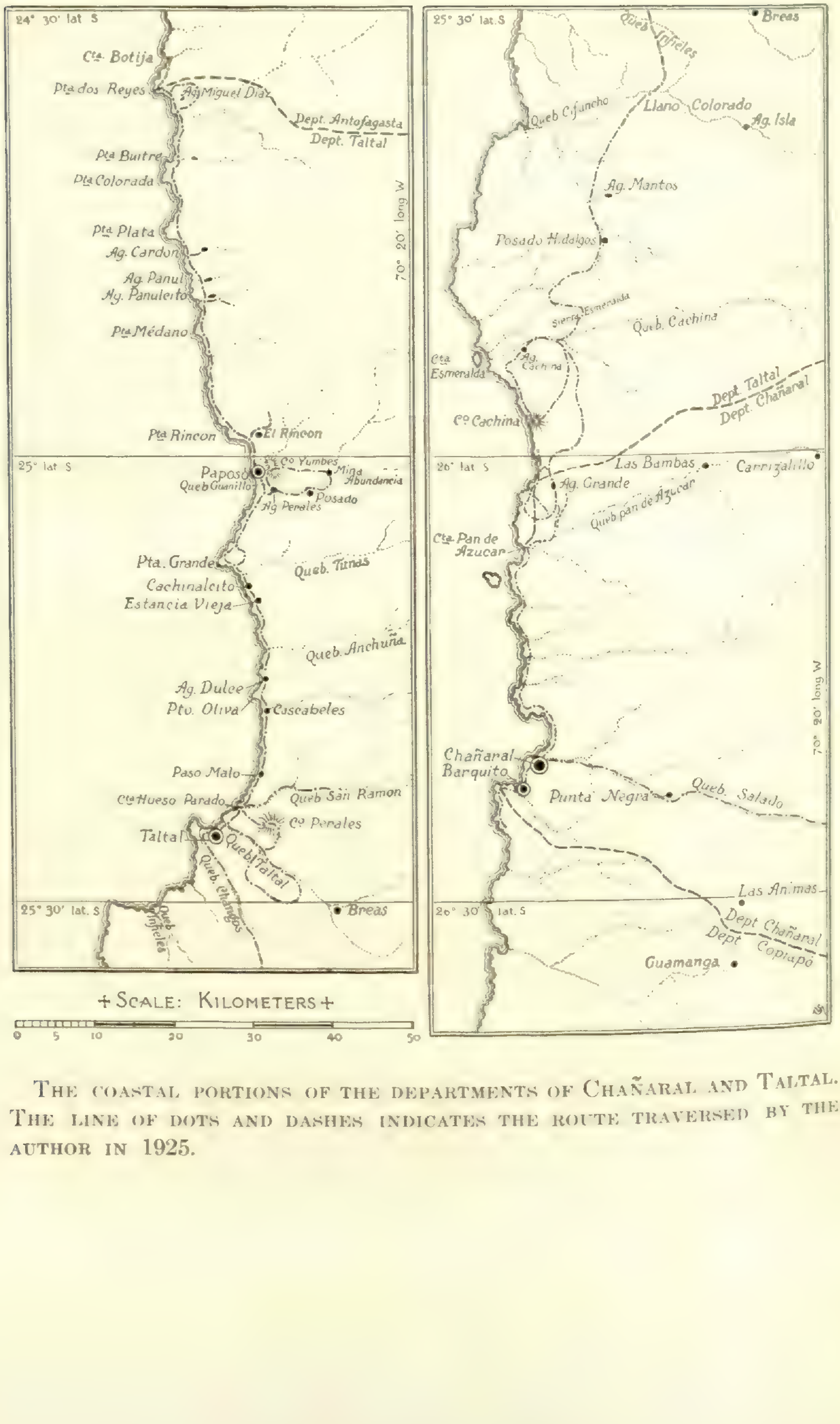
A. hirsuta β alpestris Schlecht. & Cham. Linnaea, v. 572 (1830) = Probably *A. subalpestris* Rose; A. APHANOIDES var. SUBALPESTRIS (Rose) Perry.

A. hirsuta β. calvescens Presl. Epim. Bot. 199 (1849) = Possibly A. APHANOIDES L. f. Suppl. 129 (1781).

A. hirsuta α. campestris Schlecht. & Cham. Linnaea, v. 572 (1830) = In part at least A. SIBBALDIAEFOLIA HBK. Nov. Gen. et Spec. vi. 225 (1824).

A. MONANDRIA Sw. Prod. Veg. Ind. Occ. 38 (1788). An inadequately characterized species probably resting on some mistake in identification as the name does not appear in Swartz's subsequent work.

A. PINNATA f. ROSULATA Pilger?, Herzog's Bolivianische Pflanz. in Medeel. Rijks Herb. no. 46 (1922). A form as yet characterized solely by its descriptive name, which however fails to differentiate it from the typical form of the species.



THE COASTAL PORTIONS OF THE DEPARTMENTS OF CHAÑARAL AND TALTAL. THE LINE OF DOTS AND DASHES INDICATES THE ROUTE TRAVERSED BY THE AUTHOR IN 1925.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY

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I. PAPERS ON THE FLORA OF NORTHERN CHILE

1. The Coastal Flora of the Departments of Chañaral and Taltal

The coastal portions of the departments of Chañaral and Taltal are classical in Chilean botany since Philippi obtained there a very large proportion of the plants he described and named in that pioneer floristic work on northern Chile, the Florula Atacamensis. The region is of interest botanically, however, for more than mere sentimental associations. From it were obtained the type-material of some of the common plants of northern Chile. Furthermore the area is remarkable for the large number of species restricted to it or ranging only a short distance beyond its borders. It is a center of pronounced endemism. Probably most attractive to the field-botanist, however, are the close proximity and the violent contrasts of lush mesophytic and decidedly xerophytic plant-associations that have resulted through the localized effect of sea-fog in this prevailingly desert region.

The area here treated lies west of long. 70° 20′ W. and consists of the adjoining parts of the provinces of Atacama and Antofagasta, approximately those between lat. 24° 30′ and 26° 30′ S. It fronts the ocean for about 200 km. and, because of irregularities in the coastline, varies between 20 and 45 km. in breadth.

In topography the country is rough. The northern quarter of the area includes the tip of a broad tongue of high land extending from the Cordilleras. This prominent land-mass maintains an altitude of 1500 to 3000 m. and runs to within 10–15 km. of the ocean, dominating the coast for about 80 km. north of Paposo. At no other place in all northern Chile does such a mass of high land so closely approach the ocean. In this region the ridges, rising directly from the narrow coastal plain reach an average height of about 1000 m. In the larger part of our area, that lying to the south of Paposo, the prevailing altitudes are below 1500 m. with only a few scattered points reaching towards 2000 m. The topography here is similar to that in the contiguous regions that extend south towards Coquimbo. It may be described as rising towards the east and covered with numerous hills and small mountain ranges that become higher and more massive as they approach (well beyond our eastern limit) the main Cordilleras.

In the southern half of the area the drainage consists in the main of broad gently descending valleys with dry stream-channels, the branches of which penetrate into the Cordilleras. In the northern

part, however, owing to the high mass of land mentioned, the drainage consists primarily of short, frequently abrupt stream-ways extending only 30 km. or much less into the interior. Throughout the whole region the stream-ways are normally devoid of all running water. Except for a few moist areas that have developed as a result of obstructions of the small sub-surface drainage, these stream-beds are dry and carry water only in the extremely rare periods of copious showers.

Meteorological data are available for only one locality. Observations made at the port of Taltal, alt. 39 m., over a period of ten years are summarized in the Anuario Estadístico 1926, vol. i, 4 (1927). These show that the average temperature for the year is 17° C., the average for January (midsummer) being 21.6° C. and that of July (midwinter) being 13.8° C. For the ten years the absolute minimum temperature noted was 5.8° C. and the absolute maximum 30.9° C. These figures are probably characteristic for the coastal plain throughout the length of our area, although they no doubt average several degrees low for the drier interior parts.

The precipitation is excessively scanty and erratic. So far as records are available for the eight years ending with 1921 the average precipitation at Taltal appears to be about 11 mm. yearly. Including these eight years and the following four, through 1925, the average becomes 16 mm. The most of the rainfall each year comes as the result of one relatively large shower. The following tabulation of the precipitations for the years 1919 to 1925 (all available), adapted from the Anuario Estadístico for the years 1920 to 1926, although apparently representing a wet cycle, give an idea as to the character and distribution of the rains at Taltal. Along the eastern border of our area, of course, the fall is much less and, especially in the northern part, may be quite lacking.

ANNUAL RECORD OF PRECIPITATION AT TALTAL

Year	Total mm.	Maximum in one day mm.	Date of maximum	Number of days with 0.1 mm. or more	Number of days with 1.0 mm. or more
1925	20.8	14.0	1 viii	10	4
1924	14.4	6.5	10 ix	9	4
1923	20.8	12.0	9 vii	11	7
1922	17.1	3.4	9 v	15	5
1921	4.9	2.0	2 viii	6	2
1920	28.8	14.0	21 vi	6	6
1919	10.6	5.3	29 vi	8	?

Fortunately, however, the meager precipitation is more or less offset by the effects of the wet sea-fogs, the so called "camanchaca." This

fog hangs usually somewhere between altitudes of 300 and 800 m. and drifts landward against the peaks and ridges facing the ocean or through breaks in the chain of coastal hills somewhat into the interior. Near the shore the camanchaca, lowering somewhat at night and rising a little in the morning, may hang at its characteristic altitude for days at a time wreathing the peaks and slopes exposed in a dense cloud and moistening them with mists resulting from its condensation. A definite belt is thus formed on these fog-bathed slopes, in which, especially during the winter, the humidity is high and where frequent protection is afforded against the dessicating effects of the sun. The soil is much moister than in those places depending on the scanty rain and develops a very much more dense vegetation. Because the high coastal ridges in the region north of Paposo are an almost complete obstruction to the fog in its easterly off-sea drift and consequently retain practically all of it banked upon their slopes this section benefits most strikingly from the camanchaca. In this region the fog-bathed slopes have a particularly luxuriant winter- and spring-vegetation and develop a definite fertile zone, which viewed from a distance on a clear day, appears as a distinct green belt on the mountainside.

About Taltal and to the southward the effects of the camanchaca are usually neither so localized nor so conspicuous. The ridges near the ocean are lower and interrupted by the broad mouths of valleys. As a result the fog is not so completely held back and its effects so narrowly concentrated as north of Paposo, but is able to drift inland and dissipate its moisture over a larger area. Except for a few places with special local conditions, the slopes in this region are moistened by fog only as it slowly drifts in passing. The vegetation here is hence less luxuriant and shows less contrasts than further north, but on the other hand it does extend further inland.

The slopes frequently bathed by the sea-fog support three characteristic plants. These are *Cereus spinibarbis*, *Cereus coquimbanus* and *Euphorbia lactiflua*. Although growing on the moistest of slopes and frequently covered with fruticose and foliose lichens or even supporting the large epiphyte, *Tillandsia Geissei*, these plants, like all the other shrubs in the fog-belt are xerophytic in type, for otherwise they could not persist during the dry fogless days of summer. Being conspicuous and common plants and growing in any abundance only on those slopes frequently wreathed in fog they are the outstanding species of the zone which because of the comparative luxuriance of its flora has, for convenience, been termed the "fertile belt." As has been already intimated this fertile belt is best developed and most sharply demarked on the hills about Paposo and northward to Miguel Diaz. There the

two species of *Cereus* and the *Euphorbia* are dominant, growing scattered over the slopes or with such species as *Oxalis gigantea*, *Heliotropium Philippianum*, *Salvia Gilliesii*, and *Proustia tipia* forming small thickets. The epiphytic lichens are large and conspicuous. Under the bushes grows *Polypodium Espinosae* and occasionally with it, but more frequently upon stems of shrubs and cactus is found its congener, *P. masafuerae*. About the shrubbery are found numerous small perennials. There are tufted grasses of the genera *Poa*, *Eragrostis*, *Elymus*, *Koeleria*, *Trisetum*, *Stipa* and *Nassella* and attractive species of the higher monocotyledons belonging to the genera *Scilla*, *Leucocoryne*, *Cummingia*, *Zephyra*, *Hippeastrum*, *Alstroemeria*, *Tigridia*, *Sisyrinchium* and *Bipinnula*. Among the dicotyledons the conspicuous perennials are members of the genera *Sisymbrium*, *Trifolium*, *Astragalus*, *Linum*, *Palaua*, *Hypericum*, *Cryptantha*, *Verbena*, *Calceolaria*, *Solanum*, *Bahia* and *Polyachyrus*. The annuals are not especially conspicuous. *Erodium cicutarium* is a common ground cover. Other herbs most frequently belong to the genera *Drymaria*, *Stellaria*, *Lepidium*, *Lotus*, *Adesmia*, *Palaua*, *Malvastrum*, *Centaurium* and *Amblyopappus*. About rocky places in the fertile belt grow the large and very conspicuous *Nicotiana solanifolia* and *Puya copiapina*. The distinctive *Peperomia Doelli* with its succulent green and red leaves and the beautiful violet-flowered *Alstroemeria violacea* also frequent such habitats.

South of the region about Paposo, as already suggested, the fertile belt is less conspicuously developed. Only in a few places as, for example, the head of the high line of sea-cliffs near Aguada Grande is a comparable luxuriance approached. These places, however, are not extensive. In the area about Taltal the camanchaca, merely impeded by a few high hills, drifts inland gradually thinning and eventually disappearing in the dry air encountered there. The slopes of the various hills brushed by the fog, hence, vary according to their location in the amount of moisture they receive from it and consequently in the degree of luxuriance of their flora. Distinctions between the fertile and the non-fertile area are by no means so sharp as further north, the vegetation on the fog-bathed slopes imperceptibly changing as it recedes from the sea from rather mesophytic to more and more decidedly xerophytic, thus becoming more and more like that on the slopes outside the fog-belt until quite indistinguishable in composition. Only those slopes in the fog-belt near the sea are moistened sufficiently to bear a good stand of *Cereus* and *Euphorbia*. Only these I have considered as a part of the fertile belt. But even here the flora is not so rich as further north.

Below the fog-belt the vegetation has to depend for moisture upon some such meager precipitation as that reported at Taltal. Although getting scanty moisture from the clouds, the region, particularly near the shore, gets some benefits from them in the form of increased humidity and their protection from the direct sun. North of Paposo the region below the fertile belt consists of the lower slopes of the hills and the narrow coastal plain. The conditions are desert. The shrubs are strong xerophytes with narrow usually thickened foliage. The most important of these are *Heliotropium pycnophyllum*, *Ophryosporus triangularis* and *Chuquiraga ulicina* which are frequently joined by *Encelia canescens*, *Tetragonia maritima* and several species of *Bargemontia* and *Atriplex*. Several species of *Echinocactus* are present but the large glaucous *E. cinereus* is the most common and conspicuous of them all. Among the herbaceous plants the species of *Calandrinia*, *Adesmia*, *Oxalis* and *Cristaria* are especially numerous and conspicuous. Outstanding species of other genera are *Notholaena mollis*, *Viola polypoda*, *Loasa Bertrandi*, *Loasa tricolor*, *Cruckshanksia pumila* and *Perityle Emoryi*. South of Paposo many of these herbs and perennials extend inland and, particularly on the hills near Taltal, may occur with some of the herbs that center in the fertile belt. In the sand along the ocean are found such characteristic dune plants as *Dioscorea fastigiata*, *D. cylindrostachya*, *Microphyes litoralis*, *Cristaria thinophila*, *C. viridiluteola*, *Skytanthus acutus* and *Coldenia litoralis*.

The flora of the slopes and ridges projecting above the fog-belt and particularly that of the hills facing the ocean north of Paposo is an especially interesting one. On ascending these slopes from the fertile belt it becomes very obvious that soil-moisture decreases rapidly. The rich flora of the fertile belt gives away in an ascent of a few hundred meters first to an arid scrub composed of *Echinocactus* and low bushes, then to a meager association of very hardy deep-rooted xerophytes and finally at about 1000 m. to completely desert slopes absolutely devoid of plants. These barren crests are apparently above the level of shower-bringing clouds and appear to be exposed to the glare of the sun for practically the year round.

Constituting the scrub zone above the fertile belt in the region north of Paposo I found *Echinocactus cinereus* and some of its smaller congeners, and such shrubs as *Ephedra* sp., *Krameria cistoidea*, *K. iluca*, *Adesmia Diaziana*, *Errazurizia multifoliolata*, *Parosela azurea*, *Balbisia peduncularis*, *Llagunoa glandulosa*, *Verbena selaginoides*, *Salvia Gilliesii*, *Bargemontia villosa*, *B. sedifolia*, *Lycium deserti*, *Baccharis taltalensis*, *Chuquiraga ulicina*, etc. Some of these range

down into the upper parts of the fertile belt, others occur in the dry coastal slopes below the fertile belt, while still others are plants of the dry interior. The herbaceous perennials and annuals are similarly heterogeneous. The plants growing at the very limit of vegetation are *Calandrinia sitiens, Cassia Brongniartii, Adesmia viscidissima, Oxalis ericoides, Viola Johnstonii, Bargemontia linearifolia, Heliotropium chenopodiaceum* and *Argylia sitiens.*

The interior back of the coastal hills north of Paposo is quite barren being shut off from the effects of fog by the coastal ridges and in addition, for the most part, projects high above the fog-belt. From Taltal southward the interior shows varying effects, although slight, from the thin fog which occasionally drifts over it. Most of the plants in the region, however, grow in stream-ways where they seem able to obtain some moisture deep in the gravel. The most characteristic of these are the shrubs, *Gypothamnium, Oxyphyllum* and *Chuquiraga.* Frequently associated with them are such species as *Heliotropium pycnophyllum, H. linariaefolium, Bargemontia villosa, Senecio Almeidae, Gutierrezia taltalensis, Gymnophyton foliosum* and *Ophryosporus triangularis.* The herbaceous flora is similar, although much poorer as to species and individuals, to that found along the coast below the fertile belt.

Ecologically the area treated in the present paper is in the main a section of the southern extension of the plant formation which is well developed in Peru and has been treated as the Loma Zone or Loma Formation by Weberbauer, Engler & Drude, Veg. Erde xii. 134–149 (1911). This formation can be traced south to between Huasco and Coquimbo. In Chile it is best developed in our area. Although similar in appearance and developing in response to similar climatic and topographic factors, the Loma Formation in Chile differs noticeably from that of Peru in the species associated in it. Many of the genera, however, are the same. If any of our area is to be excluded from the Loma Formation it must be that part along the eastern border in the interior. This region seems to be transitional to the more strictly desert formation which, developing beyond the influence of coastal fog and below 1500 m. alt., extends in the interior from approximately the latitude of Taltal south to about that of Vallenar.

Phytogeographically most of the plants in our area seem to be obviously southern in affinity. Such genera, however, as *Eragrostis, Drymaria, Alternanthera, Cleome, Hoffmanseggia, Parosela, Croton, Palaua, Malvastrum, Eremocharis, Nama, Salvia, Dicliptera, Stevia* and *Bidens* have a marked affinity to the northward and for the most part seem to be Loma-types. *Errazurizia, Perityle* and *Malacothrix* have

their closest relatives in California or Baja California. *Limonium plumosum* appears to be most closely related to species in the Mediterranean region. *Fagonia* and *Sonchus*, which occur in other parts of Chile and in California, also show this affinity. *Krameria iluca* and *Euphorbia minuta* are of interest, since outside of the Paposo region they are known only from high altitudes on the puna to the northeast of our area near the Argentine frontier. Somewhat similar is the case of *Salvia Gilliesii* which outside of our area is known only from beyond the Cordilleras in Paraguay and in northern and central Argentina.

Full recognition is given in the present paper to 394 species and varieties. Of this number over one third or some 145 are endemic to the area. More than half of the plants treated do not range south of the Copiapó Valley nor north to Tocopilla. There are four endemic genera, a crucifer, *Werdermannia*, an umbellifer, *Domeykoa*, and two mutisioid composites, *Gypothamnium* and *Oxyphyllum*. The umbellifer has two species while the other three genera are monotypes.

The first collecting done in our area was by R. A. Philippi who traversed the length of it between Dec. 8th and 24th, 1853 and two weeks later, Jan. 9–11, 1854, crossed it on the way from Taltal to the Cordilleras. Philippi landed at Chañaral on Dec. 8th and went inland to the copper mines at Las Animas and to those, in the valley to the north, at Salado. He returned to Chañaral on Dec. 11th and next day followed the shore north to Caleta de Pan de Azucar and then turned inland to the water-hole called Cachinal de la Costa where he camped for the night. This water-hole is unquestionably that now known in the region and shown on my map as Aguada Grande. The morning of Dec. 13th was spent there. Starting at 2 o'clock in the afternoon a march northeasterly for eight hours brought him to a dry camp-site which he calls Cachiyuyal. The exact location of this place is uncertain although it must be about 10 km. south of what is now called Agua de la Isla. Crossing a small pass, Portezuela de la Tapaderas, and traversing the eastern part of the Llano Colorado, Philippi proceded north the next day, Dec. 14th, to Breas where he turned westward and descended the Valle [or Quebrada] de Tartal [Taltal] to Agua del Clérigo. He camped at Agua del Clérigo the nights of Dec. 14th and 15th. This locality is described by Philippi as located on the eastern flank of Cerro de Hueso Parado, i. e. Cerro Perales, just northeast of the present town of Taltal. Agua del Clérigo is probably that now known as Agua de Perales, a spring situated at the south base of Cerro Perales or may possibly be the water-hole, located in the quebrada which cuts deeply into the southeast flank of the mountain, known as Agua de la Lora. Philippi

collected about Cerro Perales and to the westward along the shore now called Caleta de Hueso Parado. The specimens which he obtained while camping at Agua del Clérigo are for the most part merely labeled as from "Hueso Parado." During his visit the town of Taltal was as yet unfounded. The morning of Dec. 16th Philippi left Cerro Perales by the direct trail to Caleta de Hueso Parado and turning north, going over Malpaso or Paso Malo, continued along the coast to Estancia Vieja where he camped and from which he continued next morning along the coast around the promontory of Punta Grande to Paposo. The old village of Paposo, where Phillippi had his headquarters until Dec. 22nd, lies a short distance to the north of the present town of that name. Philippi explored the coastal plain about the town and made one excursion into the hills above visiting Quebrada [or Cajon] del Guanillo on Dec. 20th. In the quebrada he penetrated to about the point where Mina Abundancia is now located. He mentions visiting Agua de Perales, located in the mouth of the quebrada, and, further up, Agua de Arriba. The latter station is unquestionably that now called Posada. During the vain hunt for certain trails he appears to have ascended the sides of the quebrada and got well into the fertile belt. Late in the afternoon of Dec. 22nd Philippi again started northward along the coast camping that night north of Punta del Rincon at a place he calls El Médano. The following day he visited Agua de Panul and Aguada de Miguel Diaz and camped a little north of Botija. On Dec. 24th he continued north to El Cobre. Subsequently he went to Mejillones by boat. He returned by water and landing at Caleta de Tartal [Taltal] on Jan. 8th, 1854. After spending several days in outfitting for his journey in the Cordilleras he again left Agua del Clérigo on Jan. 11th and proceeded up Quebrada de Taltal past Breadal to Cachiyuyal. This latter locality is a different one from that which he visited on Dec. 13th. On Jan. 12th Philippi continued eastward to Cachinal de la Sierra and hence well beyond our area.

The plants which Philippi collected in our area together with those he obtained in the Cordilleras became the basis of his well known Florula Atacamensis. Almost all the species he treated in this work were newly described. Unlike many of his later species, however, these appear to be mostly valid. More than half of the total number of species described in the Florula Atacamensis were based upon collections from our area. Philippi's herbarium is now preserved in the Museo Nacional at Santiago. Some of the material he collected is also to be found, usually under ambiguous labels, in various herbaria in Europe.

Associated with Philippi's collections in the herbarium at Santiago are four other important, though much smaller and less representative ones made by San Roman, Larrañaga, Borchers and Darapsky. Those by Francisco San Roman are mostly from Esmeralda or Sierra Esmeralda and were made in 1883–4. San Roman, however, also collected at Paposo, Breas and Valle Salado. Almiro Larrañaga made a large collection in 1888 at Breas. This consists of some plants from the dry interior but mostly from the fertile belt. I suspect, therefore, that although labeled as from Breas they may have come in fact from some of the fertile slopes nearer Taltal. Augusto Borchers made collections between 1887 and 1889. The largest number of plants were obtained by him in Oct. 1887 when he appears to have visited Taltal, Hueso Parado, Caleta Oliva and Paposo. Luis Darapsky collected about 1889, almost entirely in the vicinity of Taltal.

Carlos Reiche, during an investigation of *Euphorbia lactiflua* as a possible rubber-plant, visited the area in 1909, cf. Opazo & Reiche, Anal. Agron. iv. 189–237 (1909). Coming overland from Caldera he entered the area from Pozo de Guamanga on Sept. 14, 1909 and went by way of Las Animas to Chañaral. On Sept. 16th going north along the coast to Pan de Azucar he turned inland to Las Bombas, and, the following day went from there north to La Isla. Traveling via Breas he arrived at Taltal on Sept. 18th. After having explored a short distance along the coast south of Taltal he continued on Sept. 20th northward to Paposo. He made a hasty visit to Quebrada de Perales, i. e. Quebrada Guanillo, and along the coast towards El Rincon and on Sept. 22nd returned to Taltal from which he sailed for Valparaiso. There are a few specimens in the museum at Santiago that were collected by Reiche during this journey. Apparently the chief result of the visit was the paper, "Ein Frühlingsausflug in das Küstengebiet der Atacama," Bot. Jahrb. xlv. 340–353 (1911), containing many distributional and ecological notes on the flora of the area.

During October and November 1925, E. Werdermann collected in the region about Taltal. The material which he obtained has been distributed widely in his admirable set of Chilean exsiccatae and is to be found in many of the leading herbaria in America and Europe.

My own collecting in our area (for route see PLATE 1) began on Oct. 28th, 1925, when I arrived at Barquito by train from Potrerillos. The next two days I collected on the slopes and crests directly back of that port and a few kilometers along the coast toward the south, finally returning to Potrerillos late in the day on Oct. 30th. About

a month later I returned to the area, landing at Taltal on Nov. 23rd. On Nov. 25th I went about 10 km. up Quebrada de Taltal and returned to the port along the crest of the hills south of the quebrada. The following day I collected in and about Quebrada de San Ramon, which opens at the far end of Caleta de Hueso Parado just north of Taltal. I ascended the quebrada 7–10 km. The day of Nov. 28th I followed the coast north to Cachinalcito. The next day I proceeded to Paposo following the foot of the hills and going up over the ridge directly back of Punta Grande eventually joining the telegraph trail some 2–3 km. north of the tip of that promontory. Continuing north along the coast on Nov. 30th I reached Aguada del Cardon, a spring in a small quebrada just south of Punta Plata, and next day arrived at Aguada de Miguel Diaz. On Dec. 2nd I visited the adjacent Punta de dos Reyes, ascended the ridge back of it to the very crest of the mountain and returned to the water-hole down a ridge just to the south, thus making a complete circuit of Aguada de Miguel Diaz. The next day I collected in the quebrada above and below the water-hole. The day following I retraced my route south to Agua del Panul where I arrived early in the afternoon. Slides having destroyed the trail by which my animals could obtain water I was forced to leave Agua Panul the morning of Dec. 5th and move a few kilometers south to Aguada de Panulcito. From my camp here I ascended an old but very well marked trail to the very crest of the coastal hills and visited the abandoned Andacolla Mine. Provisions having become exhausted, I returned to Paposo on Dec. 6th. The next day I visited El Rincon, a very foggy and fertile corner in the hills east of Punta del Rincon and just north of Paposo. Here I was again able to reach the very crest of the coastal hills, ascending a well defined trail that leads to the abandoned Parañas Mine. Starting again from Paposo on Dec. 8th, I visited Quebrada Guanillo, ascended it to Mina Abundancia and then cut west across a barren plateau to the head of the abandoned incline-railroad that scars the flank of Cerro Yumbes directly east of Paposo. From this ridge-crest I returned to town by way of a small grassy quebrada that joins Quebrada Guanillo near Agua Perales. On Dec. 9th I returned to Taltal. On Dec. 11 I went up Quebrada Taltal a few kilometers and thence north to Cerro Perales. I ascended this peak following a trail up the principal quebrada on the southeast side, visiting en route Agua de la Lora. After attaining the summit I descended the rough western side of the mountain to a point just west of Agua de Perales. I visited these springs and then followed the well marked trail to Caleta de Hueso Parado and thence to Taltal. On Dec. 13th I left

Taltal, traversed Quebrada de los Changos and skirted the western end of Llano Colorado eventually getting south to Posada Hidalgos. The following day I continued southward by a trail not shown on any map available to me and so consequently I am somewhat uncertain as to its exact path. Leaving the wagon-road and tending more directly southward I followed an obscure trail that starts off through the hills at Posada Hidalgos from near the water-hole and just to its left as one approaches it from the road. After several hours of travel with my pack-train I reached what my guide called Pique de Jacinto Diaz. This is a well dug in a broad sandy stream-way that a short distance below plunges into a gorge on its westerly course to the sea. I judge that Pique de Jacinto Diaz must be at the western or southwestern end of the Sierra Esmeralda. After passing the well the trail, avoiding the gorge, veered to the left and entered another broad quebrada down which I descended until it was joined by another on the right. Ascending this latter to its head I came to what my guide termed the Portezuela de Mina Carola. This is a high pass in the Sierra Esmeralda, adjacent to the Carola Mine, which looks out over a vast tract of land to the south. Descending a steep trail I arrived in Quebrada de la Cachina and followed that stream-way down to the water-hole, some 5 km. from the coast, known as Aguada de la Cachina. On Dec. 15th I visited the crest of the high sea-cliffs to the west and followed them south to their highest point which is known as Cerro de la Cachina. I returned to camp over the dissected granitic plain that stretches south from Aguada de la Cachina. The following day I collected in the region about the water-hole and next day, after retracing my steps a short distance up Quebrada de la Cachina, traveled south until I met the telegraph-line which I then followed southwesterly almost to the coast. That night I camped at Aguada Grande, just within the Department of Chañaral and in the upper part of a quebrada the head of which is at the crest of some very high foggy sea-cliffs. Philippi visited this locality and called it Cachinal de la Costa. I collected in the quebrada about the water-hole, along the crest of the adjacent sea-cliffs and off towards the high headland to the west. On Jan. 18th I followed down the quebrada until it joined Quebrada de Pan de Azucar and then turned west to Caleta de Pan de Azucar. From there I followed the coast to Chañaral and Barquito. The following day I left for Copiapó by rail. I collected in the area 930 numbers.

I keenly enjoyed the period I spent traveling and botanizing in the region. Much of this pleasure can be attributed to the friendliness and courtesy I met everywhere. Several people, however, were

particularly helpful. Through the kindness of Mr. William Wraith, of the Andes Copper Company, I was permitted to start my collecting journeys in northern Chile in the friendly surroundings at Potrerillos where I obtained much help and experienced advice. As a guest of the Company I was also permitted to stay in its house at Barquito while collecting about that port. Mr. J. D. Timberlake, of Copiapó, was another extremely kind and very helpful friend. At Taltal, Mr. A. Campbell, Agent for Grace & Co., was very obliging. Through him I was able to obtain quickly information regarding trails and to get equipped. From Don Celedonio Prado, of Paposo, I also had much valued assistance. Lacking even a letter of introduction I was received by him most hospitably and even provided with provisions on credit. This courtesy made it possible for me to botanize on the rich slopes about Paposo for several days longer than would otherwise have been possible. To all these gentlemen and to the many others who helped me less conspicuously I wish again to state my appreciation of their kindnesses and to give them once more and now publicly my thanks. I hope that their amused curiosity as to why a botanist should deliberately select such a "desert" as a field for collecting may find some answer in this paper.

This paper on the coastal flora of the departments of Chañaral and Taltal is based chiefly upon a study of my collections in the area. These I determined by comparison with Philippi's types at the Museo Nacional in Santiago. I made notes on most of the specimens from the area which are contained in the Museum there and have incorporated these in the present report. After my return to the United States in 1926 the literature on the subject was thoroughly overhauled and my determinations were again checked by material available for comparison there. I have also had assistance from several specialists, particularly from Dr. Carl Epling (*Labiatae*), Prof. A. S. Hitchcock (*Gramineae*), Dr. R. Knuth (*Oxalis*), Dr. F. W. Pennell (*Scrophulariaceae*), Prof. R. Pilger (*Plantago*), Dr. E. E. Sherff (*Bidens*), Mr. L. B. Smith (*Bromeliaceae*), and Dr. E. Werdermann (*Cactaceae*). Prof. Robinson and Mr. Weatherby of the staff of the Gray Herbarium have also assisted me, the former determining my *Compositae-Eupatorieae* and the latter my *Pteridophyta*. To all these persons and to Prof. Francisco Fuentes, who allowed me the important privilege of studying in the Philippi Herbarium, I wish to express my appreciation and thanks for the help without which my task could scarcely have been completed.

CATALOGUE OF SPECIES

POLYPODIACEAE[1]

Dryopteris rivularioides (Fée) C. Chr. ex Rosenstock, Hedwigia xlvi. 125 (1906).

This large fern was seen only at Ag. Panul (*J. 5422*) where a local colony of it was found in wet gravel in the lower part of the gulch just above the water-hole. It was determined by Dr. Christensen who wrote regarding it: "The specimen is a mature one and apparently young leaves are rather hairy . . . traces of pubescence are evident. . . In *D. rivularioides* the indusia are small and early falling; very likely the Chilean form has similar indusia. In the creeping rhizome, shape and texture, revolute margins, glands, etc., it agrees closely with *D. rivularioides*. This species is common in southern Brazil, Uruguay, Northern Argentina and Paraguay, growing in humid localities. . . Fern species of marshes and bogs are . . . of a very wide distribution and therefore I do not consider it improbable that *D. rivularioides* occurs in the lowlands west of the Andes. . . All things considered, I prefer to name your specimen *D. rivularioides*, although it, according to the label, grows much larger than any other form seen by me." The plants at Ag. Panul grow 12 dm. tall.

Asplenium fragile Presl, var. **lomense** Weatherby, var. nov., palearum cellulis medianis quadrato-oblongis, lumina magna; frondibus adultis 15–22 cm. longis; stipitibus castaneo-brunneis; laminis linearibus, adultis 10–18 cm. longis, circa 1.5 cm. latis; rachibus brunneis, haud marginatis; pinnis saturate viridibus 24–40-jugis levissime trilobatis vel undulatis, 6–8 mm. longis, 4–8 mm. latis, marginibus integris, costis plus minusve evidenter evolutis ad basin versus subtus coloratis apice saepe furcatis, nervillis 2–3-jugis subremotis simplicibus furcatis vel in latere superiore basali bifurcatis.—CHILE: under rocks in bottom of the gulch above the water-hole at Aguada del Panul, Dept. Taltal, Dec. 4, 1925, *Johnston 5421* (TYPE, Gray Herb.)—PLATE 2, FIG. 1.

Only a single colony of this plant was found. It grew in a moist sheltered place under large rocks on the floor of the steep gulch directly above the watering place at Ag. Panul. The variety differs from typical *A. fragile* in having the stipes and rachis brown rather than merely fuscous beneath and the pinnae bright green, and quite thin with their margins or those of the lobes entire rather than pale green and coriaceous with their margins or those of their lobes crenate-

[1] The determinations and systematic notes on this family have been contributed by Mr. C. A. Weatherby.

dentate. Although the material from Ag. Panul is quite distinct in appearance from all other forms of *A. fragile* there seem to be no characters by which they can be specifically separated. A detailed discussion of this group of *Asplenium* will be published in another place.

Pellaea ternifolia (Cav.) Link, Fil. Hort. Berol. 59 (1841).

Growing under rocks on the arid slopes above the fertile belt above Ag. Panulcito (*J. 5453*) and Ag. Miguel Diaz (*J. 5305*). The two collections represent a form with leaflets proportionately broader than is usual in this species, the sterile ones being nearly orbicular.

Adiantum chilense Kaulf., var. **hirsutum** Hook. in Hook. & Grev. Icon. Fil. ii. t. 173 (1829). *A. glanduliferum* Link, Hort. Bot. Berol. ii. 18 (1833). *A. pilosum* Fée, Gen. Fil. 118 (1850–52).

Growing on a moist hillside at Ag. Cardon (*J. 5296*) and in moist soil under rocks in the quebrada at Ag. Miguel Diaz (*J. 5307*). The plant varies widely in the size and shape of the pinnules, which run from truncate to cuneate at the base. As there appears to be no character except pilosity on the lower surfaces of the pinnules whereby this can be separated from typical *A. chilensis*. Hooker is followed in treating it as a variety of that species.

Notholaena mollis Kunze, Linnaea ix. 54 (1834); Ph. Fl. Atac. 56 and Viage Des. Atac. 27, 230 (1860).

This is the most common fern in our area. It grows about rocks or on cliffs frequently in rather dryish places in the lower part and well below the fertile belt. It was collected near Ag. Grande (*J. 5764*), in the hills southeast of Taltal (*J. 5124*), in Queb. San Ramon (*J. 5131*), between Cachinalcito and Queb. Tunas (*J. 5172*), in Queb. Guanillo near Ag. Perales (*J. 5587*), near Punta del Rincon (*J. 5257*) and near Ag. Miguel Diaz (*J. 5308*). The plants vary greatly in size, the fronds from 0.9 to 4.1 dm. tall, and more or less in the amount of indument.

Notholaena bonariensis (Willd.) C. Chr. Ind. Fil. 459 (1906).

This species was observed only on the ridge above Ag. Panulcito (*J. 5451*) where only a couple of plants were found growing under rocks in the arid scrubby zone above the fertile belt.

Polypodium masafuerae Ph. Linnaea xxix. 107 (1857). *P. squamatum* Ph. Fl. Atac. 56 and Viage Des. Atac. 26, 230 (1860), not L. (1753). *P. atacamense* Baker ex Ball, Jour. Linn. Soc. xxii. 64 (1885) and, more definitely, Ann. Bot. v. 469 (1891). *P. mollendense* Maxon, Smithson. Misc. Coll. lxv. pt. 8, 1 (1915); Contr. U. S. Nat. Herb. xvii. 560, 570 (1916).

This *Polypodium* is known on the Chilean mainland only from the

1. ASPLENIUM FRAGILE, VAR. LOMENSE WEATHERBY, VAR. NOV.
2. POLYPODIUM ESPINOSAE WEATHERBY, SP. NOV.

fertile belt between Paposo and Miguel Diaz and is not common. In the upper part of the fertile belt on the slopes at El Rincon (*J. 5491*) it was most common, growing there in moss on bushes or cactus and rarely extending down to the moss on the ground at the foot of the latter. At Ag. Panul (*J. 5423*) a single colony was found growing in moss on the face of a rock in the bottom of the gulch above the water-hole. A single plant was also found growing in the crotch of an arborescent *Cereus* in the upper part of the fertile belt on the slopes near Ag. Miguel Diaz (*J. 5309*). The type of *P. squamatum* Ph. was collected in the fertile belt near Paposo on the slopes of Queb. Guanillo.

The collection from El Rincon comes from a point no great distance from the type locality of *P. squamatum* Ph. and was compared with Philippi's type at Santiago; there can be no doubt that the two collections are conspecific. *Polypodium atacamense* Baker is a renaming of Philippi's species because of the earlier *P. squamatum* L. A photograph of the type of *P. masafuerae* Ph. and scales from the rootstock and frond, generously supplied by Prof. Marcial R. Espinosa, prove beyond reasonable doubt that *P. masafuerae*, already referred here by Christensen & Skottsberg, Nat. Hist. Juan Fernandez ii. 41 (1920), is specifically identical. Material kindly lent from the United States National Herbarium shows that *P. mollendense* is also precisely the same, agreeing in all respects with our plant. *Polypodium masafuerae*, the oldest name, must be retained.

Between *P. masafuerae* and *P. pycnocarpum* C. Chr. Ind. Fil. 557 (1906) [= *P. macrocarpum* Presl, Rel. Haenk. i. 23, t. 1. fig. 4 (1825), not Bory (1810)], as interpreted by Maxon, the differences are slight. In the former, the pale margins of the scales are rather more pronounced, the scales of the rachis tend to be somewhat broader, and the segments of the lamina are perhaps rather more obtuse. In the scanty material of *P. pycnocarpum* seen, I can find no other differential characters, and am inclined to believe Christensen and Skottsberg correct in uniting the two in spite of their different altitudinal range. This distribution, however, may be a matter of water supply for the lomas are moist, the intermediate altitudes are dry and the higher altitudes in the Andes again moist. If the two species are to be united, the earliest valid name, *P. masafuerae* Ph., should be used.

Polypodium (§ Goniophlebium) **Espinosae** Weatherby, sp. nov., rhizomate breviter repente glauco carnoso succulento, diametro 1–1.5 cm., paleis membranaceis brunneis a basi lato peltato ovatis lanceolatisve acuminatis integris, 7–9 mm. longis 2–4 mm. latis, dense obtecto, frondes sparsas paucas emittente; frondibus omnino glabris 17–42 cm. altis, apud specimina bene evoluta conspicue apud

specimina depauperata minus dimorphis; fertilibus plerumque majoribus (apud eamdem plantam 29 cm., sterilibus 10 cm. altis); stipite stramineo siccato angulato-sulcato 8–22 cm. longo; lamina coriacea deltoidea vel ovata, 7.5–20 cm. longa, 5.5–10 cm. lata, fere ad apicem pinnata; rachi viridi angustissime alato; pinnis distantibus, 4–9-jugis, 2–6 mm. latis, ad 7 cm. longis, infimis longissimis ad apicem frondis versus gradatim decrescentibus linearibus lineari-oblanceolatis vel ad apicem frondis versus latioribus, ad basin versus angustatis, basi leviter dilatatis supra breviter infra longius decurrentibus, abrupte obtusis vel rarius acutiusculis, margine cartilagineo sparse et minute crenato-denticulato; segmento terminali segmentis proximis lateralibus aequante vel ea superante rarius valde producto ad 6 cm. longo; venatione Marginariae areolis uniseriatis irregulariter angulosooblongis costae parallellis vel subobliquis, marginem fere attingentibus; soris uniseriatis rotundis vel subellipticis fere totam spatiam inter costam et marginem occupantibus, ad apices venularum liberarum inter areolas positis; sporis ovalibus circa 50 × 30 μ, flavis, minute verrucosis; frondibus sterilibus vel substerilibus 6–25 cm. longis, stipite 4–16 cm. longo, lamina 6–9 cm. longa 3.5–7 cm. lata, pinnis 3–6-jugis, 6–15 mm. latis, oblanceolatis oblongis vel obovatis, areolis uniseriatis oblongis obliquis etiam in pinnis latissimis marginem fere attingentibus.—CHILE: under cactus on dryish slope on headland west of Aguada Grande, Dept. Taltal, Dec. 18, 1925, *Johnston 5763*; on cliff and under bushes or rarely in moss on shrubs or cactus on fog-bathed sea-cliffs near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5692;* on earth under bushes in fertile belt above El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5492* (TYPE, Gray Herb.); on earth in thicket in the middle of the fertile belt on the slopes above Aguada Panulcito, Dept. Taltal, Dec. 5, 1925, *Johnston 5452*; on earth in and about large tufts of grass in the upper part of the fertile belt on the slopes above Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5306.*—PLATE 2, FIG. 2.

An apparently local and heretofore uncollected species related to *P. intermedium* Colla (*P. translucens* Kunze) of Juan Fernandez and to *P. synammia* (Fée) C. Chr. of central and southern Chile. From them it may be distinguished as follows:

Fronds more or less dimorphic, the fully fertile ones with oblanceolate to narrowly linear pinnae 2–6 mm. wide, the sterile much smaller on the same plant with oblong to obovate pinnae; pinnae in both commonly obtuse; scales of rootstock bright brown, nearly concolorous, 7–9 mm. long; sori circular or nearly so; spores yellow, broadly oval, 40–50 × 30 μ, minutely granular-verrucose..... *P. Espinosae.*

Fronds not dimorphic; pinnae 8 mm. or more wide, generally acute; scales of rootstock darker at base or center, 5–7 mm. long; spores pale yellow, narrowly elliptic, coarsely verrucose.

Scales of rootstock very dark brown at base, lighter above, not pale-margined; pinnae coriaceous, 2–6 pairs, crenate-serrulate; sori oval; spores narrowly elliptic to sublunate, 50–60 × about 25 μ. ..... *P. synammia.*

Scales with dark brown medial band and more or less conspicuous pale margins; pinnae thin, 5–11-jugate, serrate to bipinnatifid; sori round or nearly so; spores more broadly elliptic, about 60 × 30 μ. ..... *P. intermedium.*

It is a pleasure to dedicate so well-marked and interesting a Chilean species to Prof. Marcial R. Espinosa Bustos, Cryptogamic Curator of the Museo Nacional of Santiago.

GNETACEAE

Ephedra breana Ph. Anal. Univ. Chile xci. 519 (1895).

This species was founded upon and is with certainty known only from a scanty collection made at Breas in 1888 by Larrañaga. I doubtfully refer to it a plant which grew on a dry rocky shelf on the coastal plain between Agua Dulce and Queb. Anchuña (*J. 5188*). It formed a pallid prostrate growth with colorless or light brownish sheaths and pale dry fruit.

Ephedra rupestris Benth. Pl. Hartw. 253 (1846).

I doubtfully refer to this species a plant collected on a high dry rocky crest above the fertile belt near Ag. Miguel Diaz (*J. 5366*). It is a prostrate pallid shrub with short reddish sheaths and juicy red fruit. The stems are not buried and rhizomatose and the aerial ones not so tufted as in true *E. rupestris* from the highlands of Ecuador, Peru and Bolivia. However, in the structure of the juicy fruit, in the color and form of the sheaths and in the color and size of the stems it much suggests montane material. It is not improbable that our plant is an undescribed species.

POTAMOGETONACEAE

Ruppia maritima L. Sp. Pl. 127 (1753).

Observed only in a saline pool in a vega in Queb. Cachina above Ag. Cachina (*J. 5716*). It was locally common. The specimens apparently represent the var. *rostrata* Agardh as defined by Fernald & Wiegand, Rhodora xvi. 123 (1914). The peduncles are very short.

Zannichellia palustris L. Sp. Pl. 969 (1753).

Abundant in the water-holes at Ag. Grande (*J. 5787*) and Ag. Cachina (*J. 5717*).

Potamogeton sp.

A species of this genus is reported from Paposo by Philippi, Viage Des. Atac. 26 (1860). I strongly suspect that the record is based upon a mistaken field identification of *Zannichellia*.

GRAMINEAE

Bromus Trinii Desv. in Gay, Fl. Chile vi. 441 (1853).

Collected in our area near Taltal (*Werdermann 812, 833*) and on the ridge back of Punta Grande near Paposo (*J. 5230*).

Festuca megalura Nutt. Jour. Acad. Philad. ser. 2, i. 188 (1848).

An erect annual growing in open places on the fog-bathed ridge back of Punta Grande near Paposo (*J. 5232*).

Festuca australis Nees ex Steud. Synop. Glum. i. 304 (1855).

Growing about cactus at head of sea-cliffs near Ag. Cachina (*J. 5727*) and at ca. 400 m. alt. near Taltal (*Werdermann 806*).

Festuca sp.

A coarse tufted perennial found only on the foggy crests of the sea-cliffs near Ag. Cachina (*J. 5728*) and on moist slopes in the fertile belt near Ag. Miguel Diaz (*J. 5403*). Prof. Hitchcock informs me that the plant suggests *F. dolichophylla* Presl of the mountains of Peru and that perhaps it may represent an undescribed species of that relationship.

Poa bonariensis (Lam.) Kunth, Rev. Gram. i. 115 (1829). *P. paposana* Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860).

Infrequent in the fertile belt where it forms rank clumps 5–10 dm. tall. It has been collected on the sea-cliffs near Ag. Grande (*J. 5801*) and Ag. Cachina (*J. 5730*), on the slope of Cerro Perales near Taltal (*J. 5627*), and on slopes near Paposo (*Philippi*, type of *P. paposana*), Ag. Panulcito (*J. 5474*) and Ag. Miguel Diaz (*J. 5405*). Prof. Hitchcock considers this material, which represents *P. paposana* Ph., as referable to *P. bonariensis*.

Eragrostis scabra Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860); Ph. Anal. Univ. Chile xciv. 157 (1896); Jedwab. Bot. Archiv v. 207 (1924).

Described and known only from a collection made by Philippi in the fertile belt near Paposo. I could not locate the type at Santiago.

Eragrostis peruviana (Jacq.) Trin. Mem. Acad. St. Petersb. ser. 6, i. 396 (1831). *Koeleria multiflora* Regel & Herder, Ind. Sem. Hort. Petrop. 1858: 23 (1859). *E. deserticola* Ph. Fl. Atac. 55 and Viage Des. Atac. 20, 229 (1860).

An annual which is frequent on dryish gravelly slopes and benches

on the coastal plain. It has been collected near Hueso Parado (*Philippi*, type of *E. deserticola*), Estancia Vieja (*J. 5205*), Paposo (*J. 5575*), Ag. Cardon (*J. 5291*) and Ag. Miguel Diaz (*J. 5406*). The type of *Koeleria multiflora* was grown from seeds received from Philippi. These came without doubt from our area and probably from Hueso Parado since Philippi reports this species from no other locality. Prof. Hitchcock has kindly helped me with the synonymy of this and the following species.

Eragrostis attenuata Hitchc. Contr. U. S. Nat. Herb. xxiv. 340 (1927). *Sporobolus scaber* Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 20, 228 (1860), not *E. scabra* Ph. (1860).

Moist slopes in the lower part of the fertile belt. It was collected on the foggy crests of the sea-cliffs near Ag. Grande (*J. 5798*) and Ag. Cachina (*J. 5729*) and on slopes at Punta Grande (*J. 5229*), Ag. Cardon (*J. 5290*) and Ag. Miguel Diaz (*J. 5404*). Philippi reports it from Cachinal de la Costa and Hueso Parado. The culms are prostrate or widely ascending.

Distichlis thalassica (HBK.) Desv. in Gay, Fl. Chile vi. 397 (1853).

This was noted in moist alkaline soil near Paposo, Taltal and in Queb. Cachina but was collected only at Ag. Grande (*J. 5807*).

Elymus agropyroides Presl, Rel. Haenk. i. 265 (1830). *E. paposanus* Ph. Fl. Atac. 56 and Viage Des. Atac. 26, 230 (1860).

Forming large clumps 6–12 dm. tall in moist places in the fertile belt near Paposo (*Philippi*, type of *E. paposanus*), Ag. Cardon (*J. 5292*) and Ag. Miguel Diaz (*J. 5410*). My collections which represent *E. paposanus* Ph. were referred to *E. agropyroides* Presl by Prof. Hitchcock.

Koeleria trachyantha Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860).

Described from material collected in the fertile belt near Paposo by Philippi. I found it growing in a *Euphorbia*-thicket on the fog-bathed head of the sea-cliffs near Ag. Grande (*J. 5802*). It also grows in the fertile belt above El Rincon (*J. 5541*).

Trisetum.

A tall slender species of this genus was collected on the fertile slopes above El Rincon (*J. 5539*) and Ag. Miguel Diaz (*J. 5407*). Prof. Hitchcock determined it as *T. spicatum* (L.) Richt.

Avena hirsuta Roth, Cat. iii. 19 (1806); Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 27, 229 (1860).

Philippi reports this species from Paposo and Miguel Diaz. I did not find his specimens at Santiago. Roth's name, however, is generally considered a synonym of *A. barbata* Brot.

Polypogon littoralis (With.) J. E. Sm. Comp. Fl. Brit. ed 2, 13 (1816).

Growing in moist sand below the water-hole at Ag. Grande (*J. 5800*).

Aira caryophyllea L. Sp. Pl. 66 (1753); Ph. Fl. Atac. 55 and Viage Des. Atac. 26, 229 (1860).

Reported from the fertile belt near Paposo by Philippi. I could not find his specimens at Santiago.

Nassella major (Trin.) Desv. in Gay, Fl. Chile vi. 265 (1853).

Prof. Hitchcock has referred here a plant I collected on a moist bank near the spring at Cachinalcito (*J. 5206*). The culms are laxly ascending to subprostrate. The fruit is oblong, ca. 1.8 mm. long, pale and very lustrous and with an awn ca. 8 mm. long.

Nassella pungens Desv. in Gay, Fl. Chile vi. 268, t. 75 (1853). *N. pubiflora* of Ph. Fl. Atac. 54 and Viage Des. Atac. 20, 228 (1860).

Growing in moist places in the fertile belt and forming erect tufts that about a decimeter above the base are very densely branched and bushy. The fruit is hairy, mostly oblong and 2 mm. long. This plant, which has been referred to *N. pungens* with some doubt by Prof. Hitchcock, has been collected at the head of the sea-cliffs near Ag. Cachina (*J. 5731*) and on slopes in the fertile belt near Hueso Parado (*Philippi*), on Cerro Perales near Taltal (*J. 5628*), Punta Grande (*J. 5231*) and Ag. Miguel Diaz (*J. 5408*). A plant collected at Ag. Panul (*J. 5446*) may also belong here although its culms are not bushy-branched above the base and its fruit is glabrous.

Stipa speciosa Trin. & Rupr. Mem. Acad. St. Petersb. ser. 6, v. 45 (1842).

What is apparently a form of this species was collected in rocky places at the head of the fog-bathed sea-cliffs near Ag. Grande (*J. 5806*) and Ag. Cachina (*J. 5733*) and on the dry rocky ridge-crests well above the fertile belt near Ag. Miguel Diaz (*J. 5409*). The glumes are greenish or somewhat purplish. The base of the plant is brown. It grows in strict tufts 2.5–5 dm. tall.

Stipa tortuosa Desv. in Gay, Fl. Chile vi. 281 (1853): Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 228 (1860).

One of the more common grasses in the area growing on dryish slopes or on the gravelly floors of quebradas, usually about rocks. It has been collected at Barquito (*J. 4803, 4804*), Ag. Grande (*J. 5805*), Cachinal de la Costa (*Philippi*), Ag. Cachina (*J. 5732*), Posada Hidalgos (*J. 5670*), near Taltal (*Werdermann 822; J. 5116, 5117*) and near Paposo (*J. 5540, 5561*). It also occurs about Miguel Diaz and has been reported as far north as Antofagasta.

The type, which was collected by Gay, is said to come from the

Cordillera de Doña Ana. This is probably an error for it is known with certainty only from the coastal hills of our area and southward to about the Vallenar Valley. The cordilleras of the province of Coquimbo are scarcely a likely locality for this coastal species. In the Gray Herbarium there is a collection of this species made by Gay and given as from Copiapó. The type, hence may have come from Copiapó or even from Arqueros where Gay collected more extensively and might have gotten the species.

Stipa plumosa Trin. Mem. Acad. St. Petersb. ser. 6, ii. 37 (1836); Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 20, 228 (1860).

Forming large tufts in rocky places usually just out of the fertile belt. It grows 3–12 dm. tall and becomes brittle-stemmed and frutescent towards the base. It has been collected near Barquito (*J. 4802, 4805*), Ag. Grande (*J. 5803, 5804*), Taltal (*Werdermann 824; J. 5629*) and Paposo (*J. 5599*). It is not common.

Stipa annua Mez in Fedde, Repert. xvii. 204 (1921).

Collected at ca. 300 m. alt. near Taltal by Werdermann (no. *814*).

Paspalum vaginatum Sw. Fl. Ind. Occ. i. 135 (1797); Ph. Fl. Atac. 54 and Viage Des. Atac. 16, 18, 228 (1860).

Philippi reports this species from Ag. Clérigo near Taltal, Estancia Vieja and Cachinal de la Costa. I collected it only at Ag. Grande (*J. 5799*) where it was creeping in wet gravel below the water-hole.

CYPERACEAE

Scirpus cernuus Vahl, Enum. ii. 245 (1805).

Growing in moist sand near the saline streamlet at the mouth of Queb. Anchuña (*J. 5200*) and in wet sand near the water-hole at Ag. Panulcito (*J. 5471*). Werdermann (no. *838*) has collected the plant at ca. 300 m. alt. near Taltal.

Cyperus laevigatus L. Mant. Alt. 179 (1771). *C. mucronatus* Rottb.; Ph. Fl. Atac. 53 and Viage Des. Atac. 22, 23, 26, 227 (1860).

Growing about the sandy margin of a spring-fed pool on the seashore between Estancia Vieja and Queb. Anchuña (*J. 5201*). Also collected by Philippi in wet ground at Ag. Perales in Queb. Guanillo and reported by him as occurring about the water-holes near the town of Paposo.

Cyperus conceptionis Steud. Synop. Glum. ii. 42 (1855). *Mariscus conceptionis* Clarke, Bot. Jahrb. xxx. Beibl. 68, 16 (1901). *C. paposanus* Ph. Anal. Univ. Chile xciii. 343 (1896). *C. laetus* of Ph. Fl. Atac. 53 and Viage Des. Atac. 23, 26, 227 (1860).

Collected in wet soil near Ag. Perales in Queb. Guanillo near Paposo by Philippi.

BROMELIACEAE

Puya copiapina Ph. Anal. Univ. Chile xci. 613 (1895). *Pitcairnia* sp. Ph. Fl. Atac. 50 and Viage Des. Atac. 19, 26, 224 (1860).

Growing on rocky ledges or cliffs in the lower part of the fertile belt. It was collected at the head of the sea-cliffs near Ag. Grande (*J. 5788*), in the hills southeast of Taltal (*J. 5107*) and in the quebrada at Ag. Miguel Diaz (*J. 5321*). Philippi collected it near Paposo, probably on the slopes in Queb. Guanillo whence it was also obtained by Reiche. The rosettes of leaves become very numerous and crowded forming domed masses a meter or more broad. The coarse annual flowering stems are 1–2 m. tall and produce 3–8 short spreading branches. The corolla is yellow, each lobe having a greenish splotch at the base. It is possible that this plant may be referable to *P. boliviensis* Baker, Handb. Brom. 126 (1889), a species known only from material collected at Cobija.

Deuterocohnia chrysantha (Ph.) Mez in DC. Monog. Phan. ix. 466 (1896). *Pitcairnia chrysantha* Ph. Fl. Atac. 50 and Viage Des. Atac. 15, 19, 20, 26, 27, 28, 224 (1860).

Frequent on rocky ledges below the fertile belt. It has been collected only at Caleta de Pan de Azucar (*Philippi*, type; *J. 5840*), Breas (*Larrañaga*) and near Taltal (*Borchers; J. 5097*) but is present in the coastal strip throughout our area. Philippi reports it as far north as Cobre. Reiche, Bot. Jahrb. xlv. 346–7 (1911), mentions it from near Chañaral and from Queb. Guanillo.

Tillandsia Geissei Ph. Gartenflora xxxviii. 369, t. 1302 (1889); Anal. Univ. Chile xci. 614 (1895). *T. humilis* of Ph. Fl. Atac. 50 and Viage Des. Atac. 19, 20, 26, 224 (1860).

Growing on *Euphorbia*-bushes or on cactus in the fertile belt. Frequent from Taltal to Miguel Diaz. It has been collected at Hueso Parado (*Philippi*), Paposo (*Philippi; Reiche*) and Ag. Miguel Diaz (*J. 5320*). The type came from Caldera.

Tillandsia Landbecki Ph. Linnaea xxxiii. 248 (1864).

Growing on shrubs and cactus near the summit of Cerro Perales near Taltal (*J. 5624*).

JUNCACEAE

Juncus acutus L., var. **effusus** Buch. Bot. Jahrb. xii. 250 (1890).

Common and conspicuous in the saline vegas in Queb. San Ramon (*J. 5126*) where it formed coarse stools 9–12 dm. tall. The plant also occurred in similar situations in the very saline vega in Queb. Cachina several kilometers above Ag. Cachina.

Juncus bufonius L., var. **congestus** Wahlenb. Fl. Gothoburg 38 (1820).

Locally common in moist sand near the water-hole at Ag. Panulcito (*J. 5460*). The flowers are glomerate.

LILIACEAE

Scilla triflora Ph. Fl. Atac. 51 and Viage Des. Atac. 20, 26, 225 (1860).

A frequent plant in our area growing usually in gravelly places in the fertile belt. It has been collected at Barquito (*J. 4761*), near Taltal (*J. 5100; Werdermann 768*), Breas (*Larrañaga*), Paposo (*Philippi*, type), El Rincon (*J. 5503*) and Ag. Miguel Diaz (*J. 5371*). The single erect stem becomes 3–9 dm. tall. The corolla-lobes are white with a greenish or brownish medial stripe. The plant from near El Rincon has leaves 3 cm. broad. Usually, however, the leaves are well under 7 mm. in breadth.

Leucocoryne narcissoides Ph. Fl. Atac. 52 and Viage Des. Atac. 16, 226 (1860). *L. narcissiflora* Ph. ex Baker, Jour. Linn. Soc. xi. 374 (1871).

Collected in our area near Barquito (*J. 4762, 4763*) and at Cachinal de la Costa (*Philippi*, type). Although given with the original description as from 2000 ft. alt. at "Cachinal de la Sierra" the type of this species came in fact from near the coast at Cachinal de la Costa as shown by the altitude given on the label with the type specimen and by Philippi's narrative, Viage 16 (1860). This error is clearly the result of a clerical slip. The species is an extremely variable one especially as to corolla-structures and particularly in the form of the perianth-lobes. Very closely related to *L. narcissoides* are *L. oxypetala* Ph. from Caldera, *L. incrassata* Ph. from Vallenar and *Stemmatium narcissoides* Ph. from Carrizal Bajo.

AMARYLLIDACEAE

Cummingia campanulata (Lindl.) Don ex Sweet, Brit. Fl. Garden iii. t. 257 (1828); Ph. Fl. Atac. 52 and Viage Des. Atac. 25, 26, 27, 226 (1860).

Growing in the fertile belt near Punta Grande (*J. 5217*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5369*).

Zephyra elegans Don, Edinb. New Philos. Journ. xiii. 236 (1832).

This distinctive species is known in our area only near Taltal where it has been collected by Borchers, Reiche and Werdermann (no. *776*).

Hippeastrum uniflorum (Ph.) Baker, Jour. Bot. xvi. 83 (1878). *Rhodophiala uniflora* Ph. Fl. Atac. 51 and Viage Des. Atac. 16, 225 (1860).

Known only from the type collected by Phillippi at Cachinal de la Costa.

Hippeastrum laetum Ph. Anal. Univ. Chile xciii. 157 (1896). *Rhodophiala laeta* Ph. Fl. Atac. 51 and Viage Des. Atac. 23, 26, 225 (1860).

I refer to this species collections from Ag. Grande (*J. 5755*), Taltal (*Werdermann 864*), Punta Grande (*J. 5218*), Paposo (*Philippi*, type) and Ag. Cardon (*J. 5271*). The plant grows on moist slopes in the fertile belt usually in and about shrubbery. The perianth is a beautiful rose-color. The collections from Ag. Grande and Taltal have slightly smaller corollas than in the other collections cited and may represent a variety worthy of a name. The species is very closely related to *H. uniflorum* and is perhaps not distinct. It appears to differ in having 2–4-flowered scapes and broader perianth-lobes and bracts.

Hippeastrum añañuca Ph. Anal. Univ. Chile xciii. 150 (1896).

A large local colony of this species was found on a dry gravelly flat at the base of the hills below Ag. Miguel Diaz (*J. 5370*). The perianth is lemon-yellow. The species has not been known north of the Caldera-Copiapó region. The extention of range, hence, is notable.

Alstroemeria violacea Ph. Fl. Atac. 51 and Viage Des. Atac. 15, 16, 23, 26, 27, 225 (1860).

A common and beautiful species characteristic of rocky slopes in the fertile belt throughout our area. It ranges near the coast from Caldera to Tocopilla. It has been collected at Barquito (*J. 4760*), Ag. Grande (*J. 5756*), Taltal (*J. 5098*) and Hueso Parado (*Philippi*, type). Philippi reports it from Paposo and Miguel Diaz where I also observed it. The corollas are a beautiful violet or lavender. The plant should make a handsome ornamental for the gardens.

Alstroemeria graminea Ph. Anal. Univ. Chile xciii. 161 (1896).

Frequent on gravelly benches or in loose gravelly talus along the coastal hills below the fertile belt. It has been collected only near Barquito (*J. 4811*), Taltal (*Werdermann 802; J. 5099*), Breas (*Larrañaga*, type) and Paposo (*J. 5602*). It is quite gregarious, forming large local colonies, and is peculiar in its genus because of its annual habit. The perianth is quite irregular. The outer three lobes are white and usually reddish or pinkish on the outer surface. The inner lobes (the abaxial one being half the length of the others) are yellow and spotted with brown. The plant reaches at most 15 cm. in height

and is usually less than 10 cm. tall. There are numerous ascending branches and commonly a peculiar loose tuft of slender unequal fibrous roots.

DIOSCOREACEAE

Epipetrum bilobum Ph. Anal. Mus. Nac. Chile 11, t. 3, fig. 1 (1892); Reiche, Bot. Jahrb. xlii. 190, fig. 2 (1908).

This very distinct species is known only from the Taltal Valley where it has been collected at ca. 400 m. alt. near Taltal (*Werdermann 866*) and near Breas (*Larrañaga*, type.)

Dioscorea tenella Ph. Fl. Atac. 51 and Viage Des. Atac. 26, 225 (1860); also Anal. Univ. Chile xciii. 21, t. 1, fig. 9 (1896).

This species is known only from slopes on Cerro Perales near Taltal (*J. 5612*) and in the vicinity of Paposo on slopes of Queb. Guanillo (*Philippi*, type), on the west side of Cerro Yumbes (*J. 5555*) and on the ridge back of Punta Grande (*J. 5220*). I found only three small colonies of this plant all of them in the drier parts of the fertile belt and trailing over the ground in the shade and protection of cacti. The species seems to be quite distinct.

Dioscorea Besseriana Kunth, Enum. v. 345 (1850); Knuth, Pflanzenr. [Heft. 87] iv. Fam. 43, 197 (1924).

Collected at ca. 400 m. alt near Taltal by Werdermann (no. *805*). This collection has the leaves much less deeply cordate than does the plant from central Chile.

Dioscorea fastigiata Gay, Fl. Chile vi. 54 (1853). *D. Geissei* Ph. Anal. Univ. Chile xciii. 8, t. 1, fig. 2 (1896). *D. thinophila* Ph. l. c. 10, fig. 13. *D. axilliflora* Ph. l. c. 11, fig. 3.

What I judged in the field to be this species is abundant on the dunes under the headland just north of Chañaral. As with *Euphorbia copiapina*, which also grew there, this *Dioscorea* probably also reaches its northern limit in that vicinity.

Dioscorea cylindrostachya, sp. nov., nana glabra perennis; caulibus saepe solitariis procumbentibus 1–12 cm. longis vix volubilibus gracilibus herbaceis paullo compressis e tuberi subterraneo globoso ca. 2 cm. crasso cortice brunneo tecto erumpentibus, internodiis 1–7 cm. longis; foliis paucis crassiusculis ovatis vel suborbicularibus 5–7-nervatis 1.5–2.5 cm. longis 1–2.2 cm. latis 0.8–2 cm. longe petiolatis apice obtusis et mucronatis basi late cordatis margine integris; paniculis masculinis cylindraceis axillaribus 1–3 cm. longis 5–10 mm. crassis 3–10 mm. longe pedunculatis solitariis vel ad apicem caulis versus non rariter aggregatis; perianthio campanulato ad 2 mm. longo segmentis subaequilongis oblongis vel ovato-oblongis obtusis uniner-

vatis; staminibus fertilibus 6 erectis lobis perianthii circa duplo brevioribus supra basin floris in fauce affixis; spicis femineis densifloris breviter pedunculatis; floribus sessilibus; capsulis glabris ambitu orbicularibus vel late truncato-obovatis 11–14 mm. latis; seminibus orbicularibus vel ovatis conspicue alatis brunneis 4–7 mm. diametro. —CHILE: dunes on Punta Reyes below Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5394;* on dunes at mouth of quebrada in hills northeast of Antofagasta, Oct. 19, 1925, *Johnston 3645* (TYPE, Gray Herb.).

This species is related to *D. fastigiata* Gay of the coastal dunes of the province of Atacama but differs in having cylindrical spicate rather than broadly obconic corymbose panicles. Its flowers are very obscurely glutinous. In *D. fastigiata* the perianth is usually sufficiently glutinous to cause the sand to adhere in conspicuous amounts on most specimens. This happens very slightly if at all in *D. cylindrostachya.* The new species is separated by a broad geographical hiatus from its relative and is known only from the dunes near Ag. Miguel Diaz and near La Chimba northeast of Antofagasta. It is locally frequent on the dunes with its short stems trailing over the sand.

IRIDACEAE

Tigridia Philippiana, sp. nov., glaberrima; bulbo ovoideo 15–20 mm. longo 12–15 mm. crasso tunica brunnea chartacea vestito; caule tereti erecto gracili simplici 25–45 cm. alto spatha solitaria saepe 5-flora terminato folium strictum gerenti; foliis plicato-nervosis 3–8 mm. latis, basalibus 1–2 erectis 3–5 dm. longis, caulinis 2 inferioribus 15–40 cm. longis superiora (5–10 cm. longa) evidenter superantibus; spathae valvis lanceolatis, exterioribus subsimilibus viridibus ca. 4 cm. longis 8–12 mm. latis acutis plicatis; pedicellis floriferis spathae aequilongis, fructiferis eam minime superantibus; perianthio caeruleo fugaci ca. 4 cm. diametro; segmentis perianthii in cupulam 15–17 mm. diametro brevem basaliter coalitis, interioribus minoribus 8–10 mm. longis et latis apice rotundis basim versus paullo angustatis, exterioribus obovatis 15–18 mm. longis 14–16 mm. latis apice rotundis cum acumine, ad basim versus evidenter angustatis; antheris ligulatis ascendentibus ca. 5 mm. longis; styli ramis medium versus furcatis, ramulis falcatis 2–2.5 mm. longis; ovario oblongo glabro; capsula oblonga ca. 2.8 cm. longa ca. 7 mm. crassa apice truncata basem versus attenuata; seminibus brunneis aliquid politis dense verrucosis obscure angulatis ca. 1.2 mm. crassis.—*Tigridia ?* Ph. Fl. Atac. 50 and Viage Des. Atac. 16, 26, 224 (1860). *Tigridia* sp. Reiche in Eng.

& Drude, Veg. Erde viii. 166 (1907).—CHILE: In and about a *Euphorbia*-thicket at the head of the foggy sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 17, 1925, *Johnston 5757* (TYPE, Gray Herb.); Taltal, ca. 400 m. alt., Oct. 1925, *Werdermann 854;* fertile belt near Paposo, Dept. Taltal, Dec. 1853, *Philippi;* rich moist grassy slope in fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5368;* Tocopilla, Nov. 1904, *Mozer*.

In gross habit much suggesting the other South American species, *T. lutea* Kl. & Otto, Icon. Pl. Rarior. i. 85, t. 34 (1841) and Baker in Curtis, Bot. Mag. ciii. t. 6295 (1877), but differing in having blue rather than yellow flowers, unclawed inner perianth-lobes and less deeply divided style-branches. *Tigridia Philippiana* is known only from the fertile belt in the coastal hills of the province of Antofagasta. It grows on grassy banks or in and about thickets of *Cereus* and *Euphorbia*.

Sisyrinchium graminifolium Lindl. Bot. Reg. xiii. t. 1067 (1827). *S. chilense* of Ph. Fl. Atac. 50 and Viage Des. Atac. 26, 224 (1860).

Forming tufts on grassy slopes in the fertile belt near Ag. Cachina (*J. 5688*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5367*). The flowers are yellow.

ORCHIDACEAE

Bipinnula taltalensis, sp. nov., glaberrima robusta 3–8 dm. alta; caule erecto pallide viridi basi tubercula fasciculata 10–15 cm. longa 5–10 mm. crassa carnosa fusiformia gerenti; foliis oblongis vel ovato-oblongis obtusis laxe rosulatis 25–45 mm. latis; vaginis in scapo 3–4, internodiis subaequilongis; spica 10–20-flora, bracteis subfoliaceis anguste oblongis vel oblongo-lanceolatis acutis ovario longioribus ad 45 mm. longis; sepalis viridescentibus dorsali anguste oblongo 2.5–3 cm. longo 7–8 mm. lato obtuso vel late acuto lateralibus tortis deflexis 3.5–4 cm. longis 5–7 mm. latis lanceolato-linearibus attenuatis apice et usque ad 1–1.5 cm. infra apicem margine conspicue fimbriatis; petalis superioribus sepalo dorsali saepe paullo brevioribus et cum eo galeam formantibus ellipticis obtusis vel late acutis ca. 11 mm. latis ca. 23 mm. longis albis paullo viridi-tinctis; labello orbiculato-quadrato vel orbiculato-ovato 2–2.3 cm. lato 2.2–2.5 cm. longo basi abrupte contracto et unguiculato, apice truncato vel retuso obscure incrassulo-denticulato; lamina labelli alba infra medium et latera versus viridi-tuberculata; gynostemio satis late marginato, loculis antherae incomplete bilocularibus.—CHILE: rare on moist grassy fog-bathed slope in the fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5372* (TYPE, Gray Herb.).

Obviously related to *B. fimbriata* (Poepp.) Johnston[1] but differing in its larger flower-parts and in its much broader, differently shaped and much less marked lip which is rounded or retuse rather than broadly acute at the apex. The plant comes from about 700 km. north of the most northern reported station of *B. fimbriata* and apparently is the most northerly ranging species of its genus. Only a very few plants were found; these being scattered on the moist fog-bathed grassy slopes of the fertile belt above Ag. Miguel Diaz. The plant is pale green and has greenish sepals, white upper petals smooched with *Penecillium*-green and a white lip which has a few dull-greenish excrescences.

PIPERACEAE

Peperomia Doelli Ph. Fl. Atac. 49 and Viage Des. Atac. 23, 27, 223 (1860).

Growing on ledges and cliffs in the lower part of the fertile belt. It is known only from near Ag. Cachina (*J. 5704*), Agua Perales in Queb. Guanillo (*Philippi*, type; *J. 5591*), Ag. Cardon (*J. 5277*) and Ag. Miguel Diaz (*J. 5393*). Philippi reports it from Ag. Panul. It is an attractive erect succulent with extremely thick verticillate leaves, which are flattish or slightly concave and green above but very strongly convex and reddish beneath. The stems are also reddish.

URTICACEAE

Parietaria debilis Forst. Prodr. 73 (1786). *Freirea erecta* Ph. Fl. Atac. 49 and Viage Des. Atac. 223 (1860). *F. humifusa* of Ph. Viage Des. Atac. 26, 27 (1860).

Erect or more commonly trailing in moist or sheltered places in the fertile belt. It has been collected at Taltal (*Werdermann 865*), Ag. Cachinalcito (*J. 5196*), Paposo (*Philippi*, type of *F. erecta*), Ag. Panul (*J. 5437, 5440*) and Ag. Miguel Diaz (*J. 5392*).

SANTALACEAE

Quinchamalium carnosum Ph. Fl. Atac. 48 and Viage Des. Atac. 222 (1860). *Q. thesioides* Ph. Fl. Atac. 48 and Viage Des. Atac. 20, 222 (1860). *Q. thesioides*, var. *flaccidum* Ph. Fl. Atac. 48 and Viage Des. Atac. 222 (1860). *Q. archifolium* Ph. Viage Des. Atac. 16 (1860).

[1] **Bipinnula fimbriata** (Poepp.), comb. nov. *Chloraea fimbriata* Poepp. Frag. Synop. Pl. Chile 15 (1833); Poepp. & Endl. Nov. Gen. i. 30, t. 51 (1835). *B. mystacina* Lindl. in Hook. Jour. Bot. i. 5 (1834).

A frequent plant on gravelly benches and slopes outside the fertile belt. Its stems are usually prostrate or loosely decumbent. The foliage is commonly juicy and more or less terete. As here taken the species seems to be a very polymorphous one, varying much in the size and shape of the flowers and in he succulence of the herbage. However, it appears to differ, though not too definitely, from the congeners of central Chile in its habit, succulence and pubescent flowers. It has been collected at Barquito (*J. 4752*), Cachinal de la Costa (*Philippi*, type of *Q. carnosum*), Ag. Grande (*J. 5823*), Ag. Cachina (*J. 5738*), near Taltal (*Philippi*, type of *Q. thesioides; Werdermann 843; J. 5088, 5138*), near Paposo (*Philippi; J. 5565, 5499*), between Punta Plata and Punta Buitre (*J. 5256*) and near Ag. Miguel Diaz (*J. 5354*). The plant from near Punta Plata (*J. 5256*) is cinereous with a soft glandular pubescence. Two collections made on the dry slopes above the fertile belt near Paposo and Ag. Miguel Diaz (*J. 5499, 5354*) are glandular and have small dark-colored flowers.

POLYGONACEAE

Chorizanthe commissuralis Remy in Gay, Fl. Chile, v. 287 (1849).

A small annual growing in dryish gravel near Barquito (*J. 4779*) and Taltal (*Werdermann 860, J. 5078*). The plant is fragile and is freely disjointing at maturity. In this habit it resembles the closely related *C. brevicornu* Torr. of Southwestern United States.

Chorizanthe deserticola Ph. Anal. Univ. Chile xci. 498 (1895).

This species has been known only from the type collected at Breas by Larrañaga. I found a populous local colony in dry gravel below Ag. Grande (*J. 5777*). Its extremely numerous stems are strictly erect and crowded to form globose shrubby masses 1–2 dm. tall. The lobes of the calyx are pink with white margins.

Rumex crispus L. Sp. Pl. 335 (1753); Ph. Fl. Atac. 48 and Viage Des. Atac. 26, 222 (1860).

Philippi doubtfully reports as this species a *Rumex* seen at Ag. Panul.

CHENOPODIACEAE

Chenopodium hastatum Ph. Fl. Atac. 47 and Viage Des. Atac. 221 (1860).

A frequent plant on gravelly benches below the fertile belt. It was collected only at Ag. Miguel Diaz (*J. 5378*). The plant noted at Ag. Panul by Philippi, l. c., and reported as *C. murale* L. and as *C. album* L., Ph. Viage Des. Atac. 27 (1860), is probably this species. *Cheno-*

podium hastatum is closely related to the Peruvian *C. paniculatum* Hook. and may be only a variety of it.

Atriplex mucronata Ph. Fl. Atac. 47 and Viage Des. Atac. 16, 221 (1860).

A prostrate monoecious perennial known only from the southern coast of the Dept. of Taltal, where it has been collected at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5767, 5768*) and Ag. Cachina (*J. 5690*). *Atriplex hystrix* Ph., from Caldera, is considered by Reiche, Fl. Chile vi. 167 (1911), as indistinguishable from our plant. The Caldera plant, however, is quite distinct.

Atriplex taltalensis, sp. nov., perennis monoica farinosa suffruticosa; caulibus prostratis vel laxe decumbentibus 3–8 dm. longis ramosis; foliis concoloribus obtusis integerrimis vel sparse denticulatis, superioribus confertis subsessilibus obscurissime nervatis orbiculari-ovatis vel cordulatis (vel supremis plus minusve ovato-deltoideis) 1–1.5 cm. longis et latis cum apice breviter mucronatis, inferioribus deciduis orbiculari-ellipticis ca. 2 cm. longis basem versus in petiolum 2–3 mm. longum abrupte contractis; ramulis ultimis glomerulos florum feminorum in axillis foliorum gerentibus sed ad apicem versus glomerulos florum masculinorum nigrescentium in spicas ebracteatas divaricatas cylindricas paniculatim dispositos producentibus; bracteis fructiferis 3–5 mm. latis 4–5 mm. longis late cuneato-obovatis sessilibus medium versus connatis margine herbaceis inaequaliter tridentatis alibi laevibus vel non rariter cristato-tuberculatis; seminibus 1–1.5 mm. diametro ambitu orbicularibus; embryone subannulari, radicula verticali ascendenti.—CHILE: rocky floor of a quebrada near Antofagasta, Oct. 19, 1925, *Johnston 3635*; dryish gravelly benches and slopes about mouth of quebrada, Aguada de Miguel Diaz, Dept. Taltal, Dec. 4, 1925, *Johnston 5379* (TYPE, Gray Herb.); grassy open crests in lower part of fertile belt on ridge back of Punta Grande, Dept. Taltal, Nov. 29, 1925, *Johnston 5219;* Taltal, ca. 400 m. alt., Oct. 1925, *Werdermann 859.*

This plant has been confused with the similar and probably closely related *A. mucronata* Ph. That species, however, is matted and perfectly prostrate in habit, has a firmer scarcely if at all farinose yellowish indument on the foliage and transversely elongated much crested smaller fruit. Possibly the collections from Taltal and Antogafasta, which I have cited, should be excluded for they have stems that are reddish and more slender and leaves that are less scurfy than in the plants which seem typical of the species. The plants cited are all monoecious but field observation goes to show that some plants are predominatingly pistillate. I did not find any plants in which the

staminate flowers noticeably predominated. Doubtfully referable to *A. taltalensis* is an immature specimen collected by Larrañaga at Breas.

Atriplex clivicola, sp. nov., frutescens globosa monoica 3–12 dm. alta ramosissima incana farinosa; foliis integerrimis subplanis saepe plus minusve angulatis ovatis vel rhomboideo-ovatis vel triangulari-ovatis 1–2.5 cm. longis 8–20 mm. latis concoloribus enervatis apice obtusis basi in petiolum 3–5 mm. longum abrupte contractis; floribus in glomerulos bisexuale collectis in axillis foliorum superioribus dispositis; floribus masculinis nigrescentibus spicato-glomeratis; bracteis fructiferis glomeratis 8–12(–14) mm. longis 7–10(–13) mm. latis basem versus connatis latissime ovatis vel transverse elliptico-ovatis vel deltoideis vel cordato-deltoideis, quoad corpus subobovoideis 3–5 mm. longis 2–2.5 mm. crassis pallidis laevibus vel rarissime sparse cristatis, sed quoad marginem grandibus latis herbaceis planis undulatis vel obtuse sparseque grandidentatis; seminibus lenticularibus ca. 2 mm. latis 1.7 mm. altis margine rotundis, testa nigrescenti subnitida; embryone ellipsoideo-annulari radicula verticaliter ascendenti donato. —CHILE: gravelly benches towards crest of hills back of Barquito, Dept. Chañaral, Oct. 28, 1925, *Johnston 4765;* very dry rocky hillside at western end of the Llano Colorado, Dept. Taltal, Dec. 13, 1925, *Johnston 5652;* about rocks on coastal plain near Punta Buitre, Dept. Taltal, Dec. 4, 1925, *Johnston 5239* (TYPE, Gray Herb.).

This monoecious bush was found along the lower edge of the fertile belt and on rocky terraces along the ocean. It also occurs in the dry interior. It does not seem to be closely related to any of the known Chilean species. In Reiche's treatment, Fl. Chile, vi. 160 (1911), it keys out with *A. Philippii* and *A. myriophylla*, decumbent spreading plants with relatively small fruits.

Atriplex clivicola Johnston, var. **lopholepis**, var. nov., a varietate genuina differt bractea fructifera basem versus conspicue irregulariterque cristata.—CHILE: dry hillsides and benches below Aguada Grande, Dept. Chañaral, Dec. 17, 1925, *Johnston 5766* (TYPE, Gray Herb.).

Evidently a phase of *A. clivicola* but departing so markedly in its strongly and abundantly cristate bracts that it appears to merit nomenclatorial recognition. In habit and vegetative characters the variety is quite like the species.

Suaeda divaricata Moq. Chenop. Monog. 123 (1840); Ph. Fl. Atac. 48 and Viage Des. Atac. 16, 222 (1860).

Reported from near Cachinal de la Costa by Philippi. I noted what is probably the same species in the saline marsh in Queb. Cachina above Ag. Cachina but as the plant was not in flower, I did not collect specimens.

AMARANTACEAE

Alternanthera junciflora (Remy), comb. nov. *Telanthera junciflora* Remy in Gay, Fl. Chile v. 224 (1849); Ph. Fl. Atac. 47 and Viage Des. Atac. 19, 20, 26, 27, 221 (1860); Reiche, Fl. Chile vi. 138 (1911).

A perennial with slender loosely branched usually erect fruticulose stems 10–15 dm. tall. It grows in rocky places usually along the lower edge of the fertile belt. The sepals are pink. It is known only from near Taltal (*Philippi, Werdermann 779, J. 5622*), near Paposo (*J. 5236*) and Ag. Miguel Diaz (*J. 5299*). Although Philippi reported it from Hueso Parado, Paposo and Miguel Diaz the only specimens in his herbarium are from Hueso Parado. Remy did not give a definite locality for the species but simply said "Se cria en la República." The species concerned here is known only from the coastal hills of the department of Taltal and does not appear to have been collected in the relatively well explored country south of Copiapó, nor is there any similar species there which could be confused with it. Possibly it extends north of our area where the type might have been collected about some of the old ports such as Cobija. The species is most closely related to *A. paniculata* HBK. of Peru and Ecuador.

NYCTAGINACEAE

Oxybaphus elegans Choisy in DC. Prodr. xiii. pt. 2, 431 (1849).

Collected at Taltal by Werdermann (no. *861*) and reported from near Chañaral by Reiche, Bot. Jahrb. xlv. 346 (1911).

Oxybaphus micranthus Choisy in DC. Prodr. xiii. pt. 2, 432 (1849); Ph. Fl. Atac. 47 and Viage Des. Atac. 20, 26, 27, 221 (1860).

Philippi reported this species from Hueso Parado, Paposo and Miguel Diaz. He collected it, however, only at Miguel Diaz.

PHYTOLACCACEAE

Anisomera littoralis (Poepp. & Endl.) Moq. in DC. Prodr. xiii. pt. 2, 25 (1849). *Phytolacca littoralis* Poepp. & Endl. Nov. Gen. et Sp. i. 27, t. 45 (1835). *P. chilensis* Miers, Travels ii. 532 (1826), nom. nudum. *A. chilensis* Walter, Pflanzenr. [Heft 39] iv. Fam. 83, 33 (1909); Reiche, Fl. Chile iv. 142 (1911). *Ercilia volubilis* of Ph. Fl. Atac. 48 and Viage Des. Atac. 20, 26, 222 (1860).

A shrub usually scrambling over large cacti in the fertile belt. The racemes of flowers and black juicy fruit are pendant. It has been collected in the area near Taltal (*Werdermann 785*), near Ag. Lora

on Cerro Perales near Taltal (*J. 5611*) and at Ag. Cachinalcito (*J. 5195*). I also observed it near Ag. Grande, on Punta Grande near Paposo, and near Ag. Miguel Diaz. Under the incorrect name of *E. volubilis* Philippi reported it from Agua Clérigo and Paposo.

AIZOACEAE

Tetragonia maritima Barn. in Gay, Fl. Chile ii. 469 (1846); Ph. Fl. Atac. 19 and Viage Des. Atac. 12, 14, 17, 38, 193 (1860).

Common in dry gravelly places below the fertile belt. Most abundant on slopes and benches along the ocean where it forms dense bushes 3–12 dm. tall. The foliage is yellowish green and succulent. It has been collected at Barquito (*J. 4776*) and near Taltal (*Darapsky; J. 5130*). Philippi reported it from Las Animas, Cachiyuyal and Breadal.

Tetragonia macrocarpa Ph. Fl. Atac. 19 and Viage Des. Atac. 12, 193 (1860).

Philippi reported this from Las Animas and Cachinal de la Costa. In his herbarium at Santiago there is only one collection of the species made in 1853–54. That is labeled "Caldera, Cachinal, etc." and agrees very closely with material obtained by numerous collectors about Caldera. Since no other collections are to be definitely reported from north of Caldera it is possible that the specimen at Santiago, i. e. the type of *T. macrocarpa*, was obtained at Caldera and that the other stations mentioned on the label and by Philippi are the result of mistaken field identifications.

Tetragonia microcarpa Ph. Fl. Atac. 19 and Viage Des. Atac. 15, 193 (1860).

Philippi reported this species from Cachinal de la Costa. There has evidently been some confusion of data or material in the herbarium at Santiago for the plant I found associated with the label of the type of *T. microcarpa* is obviously not that described by Philippi. The dimensions of the fruit as given in the original description are those of *T. ovata* and I wonder if the name *T. microcarpa* was based upon material referable to that species and since lost.

Tetragonia ovata Ph. Anal. Univ. Chile lxxxv. 168 (1893).

Rather common near the coast throughout our area growing in dry gravelly places below the fertile belt. The branches are usually widely spreading and bear at maturity subglobose juicy red fruits. The fruit is not angled when fresh but in drying becomes somewhat quadrangular. It has been collected at Barquito (*J. 4777*), Ag. Grande (*J. 5776*) and near Taltal (*Borchers*, type). Outside of our

area I have seen collections from Huasco (*Philippi*), Caldera (*Geisse, Werdermann 462*), Antofagasta (*J. 3643*) and Tocopilla (*Reiche; Mozer; J. 3598*).

Tetragonia tenella, sp. nov., annua herbacea 2–8 cm. alta flavovirens; caulibus papillosis ramosissimis laxe ascendentibus gracilibus; ramis infimis oppositis ceteris alternis; foliis oblanceolatis vel oblanceolato-oblongis 2–2.5 cm. longis 5–9 mm. latis acutis sessilibus herbaceis inconspicue uninervatis papillosis; floribus axillaribus solitariis; calyce aliquid quadripartito lobis deltoideis acutis flavis 1–1.5 mm. longis extus papillosis intus laevibus; staminibus ca. 12 filamentis filiformibus flavis; antheris oblongis 2-locularibus; stigmatibus 1–2; fructibus ellipsoideo-fusiformibus 5–6 mm. longis ad 3 mm. latis dense papillosis vix angulatis teretibus vel paullulo compressis 1–2-locularibus, loculis uniovulatis; seminibus 1–2.—CHILE: quebrada north of Portezuelo de Mina Carola, Sierra Esmeralda, Dept. Taltal, Dec. 14, 1925, *Johnston 5677* (TYPE, Gray Herb.); Taltal, 30 m. alt., Oct. 1925, *Werdermann 850*.

I found this very distinct species only once. It formed small colonies and grew on dry gravelly benches and hillsides. The plants are yellowish in color and are not particularly succulent. Its habit and fruit readily distinguish it from all known species.

Mesembryanthemum crystallinum L. Sp. Pl. 480 (1753).

A colony of this unmistakable plant was seen on a rocky sea-ward slope near the ocean close to Agua Dulce.

PORTULACACEAE

Calandrinia caulescens HBK. Nov. Gen. et Sp. vi. 78, t. 526 (1824). *Diazia portulacoides* Ph. Fl. Atac. 22, t. 1e and Viage Des. Atac. 196 (1860).

The type of *Diazia portulacoides* came from Miguel Diaz. I collected a plant at Mollendo, Peru (*J. 3546*) which matches the type and like it appears to be a slender phase of *C. caulescens*.

Calandrinia capitata H. & A. Bot. Miscl. iii. 334 (1833).

Known in our area only from the vicinity of Taltal. I collected it on the upper slopes of Cerro Perales above Ag. Lora (*J. 5623*) and about 18 km. south of Taltal at the head of Queb. de los Infieles (*J. 5648*). Werdermann (no. *792*) has it from 600 m. alt. near Taltal. The plant is an annual with very loosely ascending stems and formed very local colonies on dryish rocky hillsides.

Calandrinia cymosa Ph. Anal. Univ. Chile lxxxv. 192 (1893).

Frequent on dry sandy or gravelly places along the coast. It has

been collected at Barquito (*J. 4787*), Taltal (*Darapsky*, type; *Werdermann 853*) and Punta Plata (*J. 5251*). It is a very distinctive annual species with loosely cymose yellow flowers.

Calandrinia sitiens, sp. nov., perennis glaberrima prostrata; radice subsimplici verticali elongato 2–4 mm. crasso; caulibus brevibus 1–2 cm. longis 2–3 mm. crassis pluribus jugum foliorum unicum gerentibus apice in pedunculos graciles inconspicue bracteatos plures 5–10 cm. longos prostratos corymbiferos abrupte transmutatis; foliis obovatis vel orbiculari-obovatis carnosis apice obtusis vel rotundis infra medium basem versus in petiolum 5–10 mm. longum 2–4 mm. latum contractis, basalibus rosulatis 4–6 cm. longis 1.5–4 cm. latis, caulinis duobus oppositis 2–3 cm. longis; corymbo laxo ca. 8–15-floro 1–3 cm. longo; pedicellis gracilibus 5–8 cm. longis ascendentibus; bracteis oblongo-ovatis acutis 1–2 mm. longis; sepalis late ellipticis ca. 4 mm. longis virido-fuscis apice rotundis; petalis sanguineis vel rariter purpureo-rubris elliptico-obovatis ca. 4 mm. longis sepalis aequilongis; staminibus 6–8; capsula ovoidea 4–5 mm. longa sepalis paullo longiori; seminibus 1 mm. longis nigris subnitidis cum tuberculis humilibus ellipticis ordinatim tessellatis.—CHILE: rocky very arid almost barren crest near Mina Andacolla near upper limit of vegetation on hills above Aguada Panulcito, Dec. 5, 1925, *Johnston 5470* (TYPE, Gray Herb.).

A very distinct member of Reiche's "Sect. 5, *Rosulatae*" and apparently most closely related to *C. cymosa* Ph. It differs from that species in its deep perennial root, prostrate habit, tuberculate-tessellate rather than papillate seeds, and blood-red or rarely purplish rather than yellow petals. The branching habit and the disposition of the leaves is similar in both species, but in *C. sitiens* the stems are prostrate rather than loosely ascending as in *C. cymosa*. The inflorescence in both species is shiny, apparently from a glutinous film. The new species was seen only on the extremely arid almost barren rocky crest near the old Andacolla Mine on the hills back of Ag. Panulcito. At that place it was one of the few hardy xerophytes that managed to exist on the very scanty moisture on the crests at ca. 1000 m. alt. and there, well above the fertile belt, and in spite of the increasing aridity, set the upper limit of vegetation.

Calandrinia cephalophora, sp. nov., annua herbacea 7–22 cm. alta glaberrima; radice palari; caulibus simplicibus et erectis vel paullo supra basem in ramos plures ascendentes 2–7 cm. longos ca. 2–3 mm. crassos decompositis apicem versus et inde in pedunculos 7–13 cm. longos aphyllos terminantibus; foliis vix rosulatis oblanceolatis carnosis 3–7.5 cm. longis 1–2 cm. latis acutis basem versus in

petiolum gracilem 1–2 cm. longum gradatim contractis, rameis apicem versus paullo congestis, supremis saepe suboppositis; corymbo capitato-congesto 12–20 mm. diametro; bracteis lanceolatis 2–4 mm. longis; pedicellis 1–2 mm. longis ascendentibus bracteis saepe subbrevioribus; sepalis orbiculari-ovatis 4–5 mm. longis aequalibus viridibus obscure nigro-venosis; petalis purpureo-rubris ca. 3 mm. longis ellipticis sepalis brevioribus apice rotundis; staminibus 10; capsula globoso-ovoidea sepalis aequilonga trivalva; seminibus ca. 0.5 mm. longis echinatis opacis nigrescentibus vel brunneo-nigrescentibus.—CHILE: Taltal, Dept. Taltal, alt. ca. 50 m., Oct. 1925, *Werdermann 855;* bare rocky quebrada, ca. 200 m. alt., near Antofagasta, April 3, 1925, *Pennell 13032;* gravelly slope on hillside opposite Caleta Duendes near Tocopilla, Oct. 18, 1925, *Johnston 3591* (TYPE, Gray Herb.).

This is a very distinctive species which seems to belong in the section *Rosulatae* although suggesting the *Arenariae*. It is characterized by its capitate congested inflorescence, oblanceolate non-rosulate leaves and northern range.

Calandrinia calycina Ph. Fl. Atac. 21 and Viage Des. Atac. 15, 195 (1860).

An annual which is frequent, especially on the gravelly coastal plain north of Taltal. It has been collected at Taltal (*Werdermann 868*), on the dunes at Punta Plata (*J. 5252, 5253*) and on a gravelly slope above the fertile belt near Ag. Miguel Diaz (*J. 5318*). Philippi reports it from Las Animas and Cachinal de la Costa. It ranges southward to the Copiapó Valley (*Werdermann 418*) and Carrizal Bajo and north to Tocopilla. The plants at Punta Plata were of two forms, one with pale green herbage and white petals and the other, the typical common form, with reddish-green herbage and pinkish-red petals.

Calandrinia cachinalensis Ph. Fl. Atac. 20 and Viage Des. Atac. 15, 194 (1860).

A slender erect glaucous annual 3–12 dm. tall which is not infrequent on dry gravel near the coast. It has been collected only at Cachinal de la Costa (*Philippi*, type) and at Ag. Cardon (*J. 5285*). Although Reiche, Fl. Chile ii. 341 (1898), associates this species with *C. litoralis* Ph., *C. cymosa* Ph. and *C. coquimbensis* Barn. its relations are certainly with *C. grandiflora* Lindl.

Calandrinia discolor Schrad. Linnaea viii. Litt. 22 (1833); Ph. Fl. Atac. 20 and Viage Des. Atac. 12, 27, 28, 38, 194 (1860).

Philippi reports this species as occurring from Las Animas to Miguel Diaz apparently using the name loosely to cover any of the robust

species of the genus. He collected no specimens and doubtless the plants he saw are in large part referable to other species I have enumerated for I saw no true *C. discolor* in our area.

Calandrinia taltalensis, sp. nov., erecta 3–4 dm. alta robusta glauca glaberrima ut videtur biennis; caulibus erectis sed imam ad basem saepe breviter decumbentibus ascendenter paucirameis; foliis obovatis crassiusculis acutis, basalibus 5–13 cm. longis 2–6 cm. latis in petiolum latum gradatim attenuatis in caulem infra medium laxe aggregatis, mediis et superioribus abrupte reductis lanceolato-oblongis; racemis laxifloris bracteosis ascendentibus pluribus; bracteis oppositis orbiculari-ovatis 8–10 mm. longis late sessilibus subscariosis; pedicellis 1–1.5 cm. longis ascendentibus vel patentibus quam bracteis saepissime duplo longioribus; sepalis orbiculari-ovatis viridibus enervatis 6–9 mm. longis obtusis; petalis purpureo-rubris obovatis ca. 13 mm. longis; staminibus numerosis; capsulis globosis ca. 9 mm. longis trivalvatis sepalis aequilongis; seminibus ca. 0.9 mm. longis cum spiculis minutis dense echinatis nigrescentibus opacis numerosis. —CHILE: flat dryish crest back of sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 17, 1925, *Johnston 5784*; rocky bushy plain at mouth of quebrada, Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5284* (TYPE, Gray Herb.).

A member of the group of *C. grandiflora* Lindl. and apparently most closely related to *C. cachinalensis* Ph. from which it differs in its more persistent root, less slender habit, coarsely bracteate shorter racemes and short non-reflexed pedicels. The seeds are similar, though in *C. cachinalensis* the surface-appendages are less rigidly erect and somewhat softer in texture.

Calandrinia lamprosperma, sp. nov., perennis robusta glaucescens ca. 5 dm. alta glaberrima sed sub lente cum papillis minutis cylindricis apicem versus brunneo-glanduliferis ornata; caulibus erectis simplicibus vel apicem versus dichotome ramosis e caudice laxo crasso ramoso fruticoso 10–15 cm. alto erumpentibus; foliis alternis usque ad 4 mm. crassis obovatis 4–6 cm. longis 2–2.8 cm. latis apice obtusis sed cum acumine basi in petiolum brevem gradatim contractis in ramis floriferis basem versus laxe aggregatis sed mediis et superioribus sparsis et valde reductis; floribus conspicue bracteatis in racemum 5–10-florum simplicem vel dichotome ascendenterque ramosum dispositis; bracteis oppositis late obovatis sessilibus 6–8 mm. longis; sepalis late orbicularibus ca. 8 mm. longis viridibus obscure reticulato-venosis; pedicellis gracilibus bracteas valde superantibus, inferioribus abrupte deflexis ad 4 cm. longis, superioribus 1.5–2 cm. longis laxe ascendentibus; petalis obovatis ca. 12 mm. longis 9 mm. latis sepala

duplo superantibus purpureo-rubris; staminibus numerosis; capsulis subglobosis trivalvatis calycibus aequilongis; seminibus nigris nitidis laevibus ca. 0.9 mm. longis numerosis.—CHILE: rocky place in mouth of quebrada below Aguada de Miguel Diaz, Dept. Taltal, Dec. 3, 1924, *Johnston 5317* (TYPE, Gray Herb.).

A very distinct species related to *C. grandiflora* Lindl. It is characterized by its branched shrubby caudex, its peculiar epidermal papillae and smooth shiny seeds. The vegetative parts of the plant were reminiscent of a small plant of the cultivated *Crassula arborescens* (Mill.) Willd., having leaves of like form and a similar though much less extensive branching caudex. The cylindrical papillae developed by the species are peculiar. These are present on most of the vegetative parts but are most abundant on the leaves. The upper fifth of these papillae is brown in color and apparently glandular. The seeds are shiny and black and, although quite smooth to the naked eye, under 40 diameters of magnification appear delicately etched with a fine reticulate pattern.

Silvaea amarantoides Ph. Fl. Atac. 22 and Viage Des. Atac. 15, 17, 196 (1860). *Philippiamra amarantodes* Kuntze, Rev. Gen. i. 58 (1891).

Frequent in dry gravel and sand on the coastal plain of our area where it has been collected at Barquito (*J. 6288*), Cachinal de la Costa (*Philippi*, type) and Punta Plata (*J. 5254*). It differs from the following species in its small, oblong or elliptical, usually pale bracts. *Silvaea corrigioloides* Ph., l. c., from Caldera seems to be synonymous.

Silvaea pachyphylla Ph. Fl. Atac. 21, t. 1c and Viage Des. Atac. 38, 195 (1860). *Philippiamra pachyphylla* Kuntze, Rev. Gen. i. 58 (1891).

The type of this species was collected between Breadal and Cachiyuyal east of Taltal. I collected material remarkably matching it at Pique de Jacinto Diaz in the Sierra Esmeralda (*J. 5679*). At that locality it was locally common on the dry gravelly floor of the quebrada. It is prostrate and apparently perennial with rounded thick amplexicaul leaves that are congested and more or less rosy in color. The corolla is purplish red. About Ag. Grande (*J. 5786*) on the dry gravel of the floor of the quebrada I found a similar prostrate apparently perennial plant. This had, however, ovate or oblong leaves and is much like the collection made by San Roman in the Sierra Esmeralda which was described as *S. capitata* Ph., Anal. Univ. Chile lxxxv. 321. (1894). Although much nearer to *S. pachyphylla*, these last two collections mentioned seem to be transitional to *S. celosioides* Ph.

Silvaea celosioides Ph. Fl. Atac. 22 and Viage Des. Atac. 196 (1860). *Philippiamra celosiodes* Kuntze, Rev. Gen. i. 58 (1891).

Collected in our area only at Barquito (*J. 4788*) and Taltal (*Werdermann 862*). The plant frequents dry gravel and, at Barquito at least, grows with *S. amarantoides*. From the latter it differs in its larger, broader, colored bracts. It is very closely related to *S. pachyphylla* and I believe further studies will show these species and *S. fastigiata* Ph. to be phases of one variable species which ranges from southern Peru to the Vallenar Valley in Chile. The vegetative parts of species in this genus seem too variable to serve as the sole basis of specific distinctions.

Portulaca Philippii, sp. nov., ramosa; caulibus e radice perenni crassa ramosa erumpentibus pluribus carnosis basem versus non rariter fruticulosis et plerumque ramosis 5–10(–15) cm. longis procumbentibus vel laxe ascendentibus ad axillas foliorum lanum albidum longiusculum gerentibus, internodiis valde abbreviatis 1–3 mm. longis; foliis numerosis alternis ascendentibus oblongo-spathulatis vel oblongis 5–8 mm. longis 1.5–2.5 mm. latis carnosis compressis persistentibus apice rotundis; inflorescentia euphyllis ca. 6–12 erectis involucrata capitata 1–3-flora; calyce supra rupturam 4–5 mm. longo; sepalis 2 usque ad quintam partem altitudinis a basi connatis triangulari-ovatis apice acutis; corolla majuscula rubra ca. 2 cm. diametro lobis ovatis calycem usque ad duplum superantibus; staminibus 25–35; capsula breviter stipitata globulosa vel ovoideo-globosa ca. 2.5 mm. longa et crassa basem versus circumscisse dehiscenti, parte superiori nitente, parte inferiore straminea disciformi vel ad patelliformi; seminibus reniformibus opacis 0.5 mm. diametro minute tuberculatis nigrescentibus.—CHILE: dry rocky slopes back of sea-cliffs near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5715;* open grassy crest at lower edge of fertile belt on ridge back of Punta Grande near Paposo, Dept. Taltal, Nov. 29, 1925, *Johnston 5224* (TYPE, Gray Herb.); dryish slope just below the fertile belt on the ridge near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5316*.

This species belongs to the group of *P. pilosa* L. In the form and dehiscence of its capsule and in the shape and roughenings of its seeds it is quite the same as *P. halimoides* L. as illustrated by Urban, Symb. Ant. v. 343, fig. h-j (1907), though of course it is not closely related to that annual yellow-flowered species of the West Indies. *Portulaca Philippii* is a strong perennial with long thick roots. The stems frequently become somewhat fruticulose towards the base. The species is distinguished in its group by its persistent habit, compressed

persistent leaves, basally circumscissile capsule and large purple-red corollas. It is the undetermined species reported from near Miguel Diaz by Philippi, Fl. Atac. 20 and Viage Des. Atac. 27, 194 (1860). I have also seen a collection from near Taltal made by Reiche. The plant from near Paposo reported as *P. pilosissima* by Reiche, Bot. Jahrb. xlv. 343 (1911), is probably also the same. On a dry silty elevated beach between Punta Plata and Punta Buitre (*J. 5250*) I collected a form of *P. Philippii* in which the axillary hairs were escessively developed apparently as in the form noted near Miguel Diaz by Philippi. The axillary hairs in this form are very numerous and surpass the leaves in length and partially obscure them in a woolly tangle. The common form of the species has fewer much less evident axillary hairs that are surpassed in length by the leaves. The latter form was found only along the lower edge of the fertile belt.

CARYOPHYLLACEAE

Stellaria cuspidata HBK. Nov. Gen. et Sp. vi. 27 (1823); Ph. Fl. Atac. 10 and Viage Des. Atac. 25, 27, 184 (1860).

Philippi reported this species from Paposo and Miguel Diaz but apparently made no collections of it for I could find none at Santiago. No doubt his reference is to the very common caryophyllaceous plant that forms tangles of procumbent stems about wet shaded places in and just below the fertile belt from Taltal to Miguel Diaz. Not finding flowering plants I did not collect it.

Spergularia arbuscula (Gay), comb. nov. *Paronychia arbuscula* Gay, Fl. Chile ii. 520 (1846); Reiche, Fl. Chile i. 211 (1896). *Arenaria teretifolia* Ph. Fl. Atac. 10 and Viage Des. Atac. 15, 184 (1860). *S. teretifolia* Ph. Anal. Univ. Chile lxxxi. 764 (1892). *A. lignosa* Ph. Fl. Atac. 10 and Viage Des. Atac. 15, 184 (1860). *S. lignosa* Ph. Anal. Univ. Chile lxxxi. 764 (1892).

Frequent in dry rocky or gravelly places below the fertile belt and particularly near the ocean. It has been collected at Barquito (*J. 4753*), Cachinal de la Costa (*Philippi*, types of *A. teretifolia* and *A. lignosa*), Posada Hidalgos (*J. 5659*) and Ag. Miguel Diaz (*J. 5357*). It is a stout twiggy bush 1–6 dm. tall, anomalous in its genus because of its habit. It can be noted in passing that the type of *A. teretifolia* has broad oblong sepals and that *A. lignosa* has lanceolate ones. The species as I have accepted it, however, seems to be quite variable and I do not think this difference is specific. Of similar habit and probably conspecific are *S. oligantha* Ph. and *S. fruticosa* Ph.

Spergularia denticulata Ph. Anal. Univ. Chile lxxxi. 769

(1892). *Arenaria denticulata* Ph. Fl. Atac. 10 and Viage Des. Atac. 15, 184 (1860). *S. Larrañagae* Ph. Anal. Univ. Chile lxxxi. 767 (1892).

An annual or occasionally a perennial herb frequenting dry sandy or gravelly benches. It is known only from Barquito (*J. 4754*), near Caleta de Pan de Azucar (*J. 5833*), Ag. Grande (*J. 5822*), Cachinal de la Costa (*Philippi*, type of *A. denticulata*), Ag. Cachina (*J. 5737*), north of Portezuelo de Mina Carola (*J. 5672*) and Breas (*Larrañaga*, type of *S. Larrañagae*). The seeds of this species are similar to those of *S. stenocarpa* Ph. but are dull rather than very lustrous. The type of *S. Larrañagae* is from Breas where typical material of *S. denticulata* was also collected by Larrañaga. It appears to be merely a coarse form of the species.

Spergularia stenocarpa (Ph.), comb. nov. *Arenaria stenocarpa* Ph. Fl. Atac. 10 and Viage Des. Atac. 19, 184 (1860). *S. Borchersi* Ph. Anal. Univ. Chile lxxxi. 769 (1892).

A very well marked species which is frequent on dry gravelly slopes and benches about Taltal where it has been collected at the following stations,—Taltal, 50 m. alt., (*Werdermann 799*); Queb. de los Infieles ca. 18 km. south of Taltal (*J. 5641*), Agua Clérigo near Hueso Parado (*Philippi*, type of *A. stenocarpa*), Caleta de Hueso Parado (*J. 5162*), south of Paso Malo (*J. 5177*) and Caleta Oliva (*Borchers*, type of *S. Borchersi*). Further north I collected it in Queb. Guanillo near Paposo (*J. 5604*). It is usually an annual but may become somewhat fruticulose and persistent. The plant is yellowish green and appears to be glabrate; in fact the stems are roughened with small sessile or short-stipitate glands. The seeds are wingless, black and very lustrous.

Spergularia cremnophila, sp. nov., perennis; caulibus 1–3 dm. longis prostratis vel laxe decumbentibus numerosis ramosis villosulis glandulosis teretibus e radice erecta profunda crescentibus, internodiis 1–2.5 cm. longis; foliis linearibus vel rariter lineari-oblongis 1–2 cm. longis 1–2(–3) mm. latis carnosulis compressis glabris vel marginem versus villosulis et glandulosis cuspidatis quam internodiis brevioribus vel rariter aequilongis; stipulis hyalinis 2–4 mm. longis triangularibus plus minusve lanceolatis acuminatis apicem versus saepe paullo laciniatis basi connatis; floribus cymosis; bracteis linearibus vel lanceolatis 2–5 mm. longis; pedicellis pubescentibus et glandulosis ascendentibus vel plus minusve patentibus 0.8–2.5 cm. longis; sepalis 6–7 mm. longis oblongo-lanceolatis obtusis margine scariosis; petalis albis ovato-ellipticis apice rotundis 4–5 mm. longis quam sepalis paullo brevioribus, staminibus 10 biseriatis 2–3 mm. longis ovario sesquilongioribus; stylo 1–1.5 mm. longo plus minusve

profunde trilobato basem versus et non rariter ad medium vel ultra integris; ovario ellipsoideo breviter stipitato; capsula ovoidea trivalvata 4–5 mm. longa 3–4 mm. crassa sepalis aequilonga vel paullo breviori; seminibus nigris lucidis laevibus anguste alatis 0.6–0.9 mm. diametro.—CHILE: decumbent on foggy slope at head of quebrada above Aguada Grande, Dept. Chañaral, Dec. 17, 1925, *Johnston 5821;* prostrate, in crevices at head of fog-bathed sea-cliffs near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5683* (TYPE, Gray Herb.); prostrate on exposed fog-bathed slopes about summit of Cerro de Cachina near the sea southwest of Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5684.*

This species is apparently related to *S. stenocarpa* from which it obviously differs in its large flowers, glandular-villous stems, winged seeds and perennial root. Although it seems to be rather variable in vegetative parts and in the depth of lobing of the style I feel confident that the three collections cited represent a distinguishable natural group of forms.

Drymaria cordata (L.) Willd. ex R. & S. Syst. v. 406 (1819). *D. paposana* Ph. Fl. Atac. 10 and Viage Des. Atac. 18, 25, 184 (1860).

A widely distributed species extending southward along the Pacific Coast to the vicinity of Paposo and Taltal. At the former locality Philippi collected the type of *D. paposana.* I found it to be infrequent in small colonies in the lower part of the fertile belt about Paposo, although material suitable for collecting was found only on the ridge back of Punta Grande (*J. 5213*). Philippi reported it as frequent in Queb. Taltal.

Microphyes litoralis Ph. Fl. Atac. 20 t. 1f and Viage Des. Atac. 194 (1860).

This species previously reported only from the Caldera-Copiapó region was collected on the dunes on the headland just north of Chañaral (*J. 5846*) and on a sandy slope below Ag. Grande to the east of Caleta de Pan de Azucar (*J. 5785, 5832*) and on dune-slopes about Punta Reyes below Ag. Miguel Diaz (*J. 5319*). At each station it was locally common on the sand.

Paronychia chilensis DC. Prodr. iii. 370 (1828). *P. coquimbensis* Gay; Ph. Fl. Atac. 22 and Viage Des. Atac. 25, 196 (1860).

Trailing on moist ground and forming mats in the fertile belt at Ag. Cachinalcito (*J. 5184*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5356*).

Cardionema ramosissima (Weinm.) Nels. & Macbr. Bot. Gaz. lvi. 473 (1913). *Pentacaena ramosissima* H. & A.; Ph. Fl. Atac. 22 and Viage Des. Atac. 19, 196 (1860).

Forming prostrate pungent mats in rocky places along the lower edge of the fertile belt near Taltal (*Philippi, Werdermann 781, J. 5617*), Paposo (*J. 5212*) and Ag. Miguel Diaz (*J. 5355*).

Silene gallica L. Sp. Pl. 417 (1753).

Collected by Werdermann (no. *840*) at ca. 400 m. alt. near Taltal.

RANUNCULACEAE

Ranunculus Cymbalaria Pursh, Fl. Am. Sept. 392 (1814). *R. microcarpus* Presl; Ph. Fl. Atac. 7 and Viage Des. Atac. 22, 23, 25, 181 (1860).

This plant is infrequent but often locally common in wet saline soils. Philippi reports it from near Paposo.

BERBERIDACEAE

Berberis litoralis Ph. Fl. Atac. 7 and Viage Des. Atac. 27, 181 (1860).

Known only from the type collected at ca. 260 m. alt. near Miguel Diaz by Philippi. It is described as a shrub over 3 m. (duas orgyales) tall.

CAPPARIDACEAE

Cleome chilensis DC. Prodr. i. 238 (1824); Ph. Fl. Atac. 9 and Viage Des. Atac. 19, 25, 27, 183 (1860).

A slender glandular annual herb growing on gravelly slopes and benches in the lowers parts of the fertile belt. It has been collected near Taltal (*J. 5070*), Ag. Miguel Diaz (*J. 5387*) and "Hueso Parado, Paposo, etc." (*Philippi*). Reiche, Bot. Jahrb. xlv. 345 (1911), mentions its occurrence on the hills near Chañaral. The petals are white and the anthers are purplish red. The plant is not typical *C. chilensis* as that is illustrated by Delessert, Icones iii. 1, t. 2 (1827), but appears, rather, to be the var. *pubescens* DC., l. c.

CRUCIFERAE

Menonvillea Gayi Ph. Fl. Atac. 8 and Viage Des. Atac. 12, 182 (1860).

This species barely enters our area being known in it only from the collection made at Las Animas by Philippi. It is apparently quite frequent to the southward being the common glabrous annual *Menonvillea* from Copiapó to Ovalle. The specific name is apparently due to the fact that Philippi considered, and quite correctly, that his collection from Las Animas was conspecific with one from Arqueros

made by Gay (no. *1036*). *Menonvillea parvula* Ph. seems to be a synonym of *M. Gayi* Ph. as is probably also *M. media* Turcz. (= *Cymatoptera chilensis* Turcz.), a species based upon *Bridges 1279* from "hills between Huasco and Copiapó."

Menonvillea orbiculata Ph. Fl. Atac. 9 and Viage Des. Atac. 183 (1860).

I refer here doubtfully two collections made on dry crests above the fertile belt near Paposo, one on Cerro Yumbes (*J. 5552*) and the other above El Rincon (*J. 5515*). These collections have somewhat smaller flowers and less broadly winged smaller fruit than typical *M. orbiculata* from the coastal dunes at Caldera, but resemble it in their conspicuous floccose-tomentose indument and stout habit. True *M. orbiculata* frequently becomes somewhat shrubby below. My collections, however, only suggest this tendency.

Menonvillea parviflora Ph. Fl. Atac. 8 and Viage Des. Atac. 15, 182 (1860). *M. orbiculata* Ph., var. *parviflora* Reiche, Anales Univ. Chile xc. 85 (1895) and Fl. Chile i. 55 (1896).

Growing on dry gravelly slopes and benches at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5773*), near Ag. Cachina (*J. 5697*), Sierra Esmeralda (*San Roman*), and, perhaps, Ag. Cardon (*J. 5275*) and Ag. Miguel Diaz (*J. 5314*). The species differs from *M. orbiculata* in being more slender and glabrous, and in having smaller fruit. Collections by Riveros from near Copiapó may be referable here, but otherwise the plant is known only from our area. Its nearest relative seems to be *M. Gayi* from which it differs in being a taller more erect greener plant and in having smaller more roughened and more narrowly winged fruit. It varies off to the following variety.

Menonvillea parviflora Ph., var. **aptera** (Ph.), comb. nov. *M. aptera* Ph. Fl. Atac. 9 and Viage Des. Atac. 19, 183 (1860).

An erectly branched annual growing on dry rocky slopes or in gravel. It is known only from the region about Taltal where it has been collected at Ag. Clérigo near Hueso Parado (*Philippi*, type), near Taltal (*Darapsky, Werdermann 835*), Breas (*Larrañaga*) and Queb. de los Infieles ca. 18 km. south of Taltal (*J. 5640*). It differs from *M. parviflora* only in having wingless or practically wingless fruit. Schulz, Notizbl. x. 466 (1928), has incorrectly determined Werdermann's collection as "*M. chilensis* Turcz."

Lepidium spathulatum Ph. Fl. Atac. 8 and Viage Des. Atac. 15, 25, 27, 182 (1860).

A biennial or perennial with widely spreading stems which is known only from the fertile belt in our area. It has been collected at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5772*), near Paposo

(*Philippi, J. 5514*) and Ag. Miguel Diaz (*J. 5388*). Prof. Thellung, who examined my collections of *Lepidium*, wrote me that the species is related to his *L. cyclocarpum*.

Lepidium auriculatum Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 51 (1858).

Referred here is a collection from the grassy crest in the fertile belt on the ridge back of Punta Grande (*J. 5209*). According to Prof. Thellung the collection much resembles authentic material of *L. auriculatum* but is atypical in its caducous calyx, short glands and lightly emarginate silique.

Lepidium bonariense L. Sp. Pl. 645 (1753).

Reported by Schulz, Notizbl. x. 465 (1928), from slopes in a quebrada at ca. 400 m. alt. near Taltal.

Brassica nigra (L.) Koch in Röhling, Deutschl. Fl. ed. 3, iv. 713 (1833); Ph. Fl. Atac. 8 and Viage Des. Atac. 22, 25, 182 (1860).

Reported by Philippi as very common on slopes near Paposo. I did not collect or note the species and as Philippi apparently made no collections I have no check on his determination.

Sisymbrium sagittatum H. & A. Bot. Miscl. iii. 139 (1833); Ph. Fl. Atac. 8 and Viage Des. Atac. 25, 27, 182 (1860).

A very loosely branched slender erect perennial herb growing 5–12 dm. tall on moist slopes in the fertile belt. It has been collected at Barquito (*J. 4774*), Ag. Cachina (*J. 5698*), Breas (*Larrañaga*), Taltal (*Werdermann 858*), Paposo (*Philippi*), El Rincon (*J. 5517*), Ag. Panulcito (*J. 5463*) and Ag. Miguel Diaz (*J. 5389*). The petals are white.

Werdermannia anethifolia (Ph.), comb. nov. *Nasturtium anethifolium* Ph. Fl. Atac. 7 and Viage Des. Atac. 12, 181 (1860). *Heterothrix anethifolia* Schulz, Pflanzenr. [Heft. 86] iv. Fam. 105, pt. 3, 298 (1924). *Sisymbrium carnosulum* Ph. Fl. Atac. 7 and Viage Des. Atac. 15, 181 (1860). *N. macrostachyum* Ph. Anal. Univ. Chile lxxxi. 180 (1892). *W. macrostachya* Schulz in Werd. Notizbl. x. 470, fig. 7 (1928). *S. Larrañagae* Ph. Anal. Univ. Chile lxxxi. 185 (1892). *S. pectinatum* Reiche, Anal. Univ. Chile xc. 109 (1895) and Fl. Chile i. 79 (1896).

As here taken this species is a variable but unquestionably a very natural assemblage of immediately related forms characterized by their glaucous more or less fleshy leaves with elongate distant lobes. It appears to be either an annual herb or a perennial from a woody base. The fruit varies from 7–25 mm. in length and from 2–2.5 mm. in breadth. It is weakly compressed. The seeds are brown, alveolate and not muculaginous when wet. Schulz first referred the plant to

his genus *Heterothrix*, but in habit, foliage and fruit it is not at all in agreement with the other species he places there. In habit it is much like the genus *Sibara* of Baja California. Recently, however, Schulz has erected the genus *Werdermannia* for our plant, and being uncertain as to it exact relationships I am giving the genus provisional recognition.

The material seen by me roughly falls into two groups, one of them including coarse xerophytic perennials with fruit 7–15 mm. long and with broad leaf-segments. This form I collected on dry gravelly slopes about Ag. Cachina (*J. 5699*), on a dry rocky hillside at the western end of the Llano Colorado (*J. 5654*) and in rock crevices near the ocean near Queb. Anchuña (*J. 5194*). The type of *Nasturtium macrostachys* Ph. collected by Borchers near Puerto Oliva belongs here as does apparently also the type of *Sisymbrium Larrañagae* Ph. which was collected by Larrañaga at Breas. The type of the latter species is very fragmentary and consists only of a few snips showing fruit of medium length (ca. 1 cm. long).

The second form is a smaller more bushy plant with an annual or short-persistent root, narrow leaf-segments and fruit 1.5–2.5 cm. long. I have seen it only from the fertile belt where it grows at Barquito (*J. 4773*), Ag. Grande (*J. 5775*) and Taltal (*J. 5071*). This form is apparently *Nasturtium anethifolium* Ph., the type of which came from Las Animas. Perhaps *Sisymbrium carnosulum* Ph. the type of which came from Cachinal de la Costa, is the same although the description does suggest the coarse form. The types of these two Philippian species are so broken and mixed that I could get no help from them in settling the application of these two names. A collection from Taltal made by Werdermann (no. *803*) seems to be a luxuriant phase of the slender form.

Mathewsia incana Ph. Fl. Atac. 8 and Viage Des. Atac. 15, 182 (1860).

A small bush 3–6 dm. tall growing in dry gravelly places outside of the fertile belt. In our area it has been collected at Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5774*), near Ag. Cachina (*J. 5748*), Sierra Esmeralda (*San Roman*), Taltal (*Darapsky*) and above the fertile belt at El Rincon near Paposo (*J. 5516*). South of our area it occurs back of Caldera and Carrizal Bajo. Schulz, Notizbl. x. 465 (1928), has reported it from Queb. Matancilla near Paposo. In the type of the species from Cachinal de la Costa and in my collections from Ag. Grande the fruit is glabrate or inconspicuously pubescent. All the other material seen by me has the fruit densely stellate-pubescent.

CRASSULACEAE

Tillaea erecta H. & A. Bot. Beechey Voy. 24 (1830). *T. peduncularis* of Ph. Fl. Atac. 22 and Viage Des. Atac. 196 (1860).

Dryish rocky slopes and cliffs at the lower edge of the fertile belt; not common. It has been collected near Taltal (*Werdermann 832*), Ag. Cardon (*J. 5274*) and Ag. Miguel Diaz (*J. 5386*).

ROSACEAE

Alchemilla arvensis (L.) Scop. Fl. Carn. ed 2, i. 115 (1770); Ph. Fl. Atac. 18 and Viage Des. Atac. 192 (1860).

Reported from the fertile belt near Paposo by Philippi. I could not find his specimens at Santiago.

Acaena trifida R. & P., var. **glabrescens** Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 57 (1858); Reiche, Fl. Chile ii. 229 (1898).

To this variety, which I know only from descriptions, I refer collections from the foggy sea-cliffs near Ag. Grande (*J. 5771*) and Ag. Cachina (*J. 5696*) and from hillsides in the fertile belt on Cerro Perales near Taltal (*J. 5609*), at El Rincon (*J. 5513*), Ag. Panul (*J. 5436*) and Ag. Miguel Diaz (*J. 5385*). It is a small erectly, though sparsely branched undershrub 3–6 dm. tall growing usually on rocky banks or cliffs. In gross habit and in the cut of its leaves it is quite similar to *A. trifida*, but is glabrate and perhaps has somewhat smaller flowers and inflorescence. The plant, although apparently glabrous has an obscure sparse pubescence along the primary and secondary rhachises of the leaves.

Acaena canescens Ph. Fl. Atac. 18 and Viage Des. Atac. 25, 192 (1860).

Probably as a result of a clerical error Philippi reports this species from Paposo. The species, however, is one characteristic of vega-margins in the cordilleras and is apparently only a phase of *A. macrostemon* Hook. f. There are no collections of the species from Paposo in the herbarium at Santiago.

LEGUMINOSAE

Cassia Brongniartii Gaud. Voy. Bonite, Bot. Atlas t. 10 (1840–42) *C. misera* Ph. Fl. Atac. 17 and Viage Des. Atac. 23, 25, 191 (1860). *C. conjugata* R. & P. ex Benth. Trans. Linn. Soc. xxvii. 540 (1871).

Philippi collected the type of *C. misera* in the vicinity of Paposo in Queb. Guanillo near "Agua de Arriba" (called "Posada" in recent maps). I looked for the plant there but did not find it, although I did encounter two seedlings a few kilometers to the northward on the

high very arid barren plain about midway between Mina Abundancia and the crest of Cerro Yumbes (*J. 5582*). A very large although local colony of the plant was found above the fertile belt near the upper limit of vegetation on the high arid ridge above Ag. Panulcito (*J. 5454*). At that station it formed a loose depressed shrub 1.5–5 dm. tall and 3–12 dm. broad. According to Bentham, l. c., Gaudichaud collected the synonymous *C. conjugata* at Cobija. The beautiful and elaborately detailed folio plate of *C. Brongniartii* is no doubt based upon this collection from Cobija. It is certain that it clearly represents *C. misera* and hence the plant with which we are concerned.

Cassia paposana Ph. Fl. Atac. 17 and Viage Des. Atac. 23, 25, 191 (1860).

This species has been collected only in the fertile belt on the slopes in Queb. Guanillo near Paposo (*Philippi*, type), on a rocky slope in the subarid zone above the fertile belt at El Rincon (*J. 5488*) and about rocks on the moist floor of the quebrada above the waterhole at Ag. Miguel Diaz (*J. 5348*). Philippi described the plant as a bush ca. 1.5 m. tall. The plants at El Rincon were 6–9 dm. tall while those at Ag. Miguel Diaz were weak and trailing shrubs.

Cassia acuta Meyen ex Vogel, Synop. Cassiae 42 (1837).

I doubtfully refer to this species a dense globose bush 5–10 dm. tall which was frequent in gravelly stream-ways about Ag. Cachina (*J. 5743*). The type of *C. acuta* was obtained a short distance to the east of the old port of Copiapó. The species appears to range southward towards Coquimbo. My collection from Ag. Cachina closely matches material from near Copiapó and near Vallenar. It is possible that *C. acuta* and *C. Cumingii* H. & A. are the same. The type of *C. alcoparra* Ph., from Illapel, has larger leaflets and is slightly less pubescent than my collection.

Cassia eremobia Ph. Anal. Univ. Chile lxxxiv. 443 (1893).

The type of this species is a sterile twig collected by Larrañaga at Breas. It is clearly the same as my collections from between Cascabeles and Agua Dulce (*J. 5166*) and from Punta del Rincon near Paposo (*J. 5238*). It was uncommon and grew on rocky outcrops and ledges on the coastal plain forming a very loosely branched bush 5–9 dm. tall. Also referred to *C. eremobia* are collections from near Taltal (*Werdermann 844*) and from the Sierra Esmeralda near Pique de Jacinto Diaz (*J. 5671*). These latter collections show an approach towards *C. acuta*. It is quite possible that *C. eremobia* may be only a northern variety of *C. acuta* differing in having duller green, slightly glandular, more pubescent, more obtuse rather oblong leaflets.

Krameria cistoidea H. & A. Bot. Beechey Voy. 8, t. 5 (1830).

A phase of this species was found growing on dryish slopes above the fertile belt near Ag. Panulcito (*J. 5455*) and Ag. Miguel Diaz (*J. 5347*) where it formed prostrate shrubby growths 1–1.5 m. broad. The species has not been previously reported from north of Copiapó.

Krameria iluca Ph. Fl. Atac. 9 and Viage Des. Atac. 183 (1860).

Quite typical of this species are the plants collected on dryish rocky slopes above the fertile belt near Paposo on Cerro Yumbes (*J. 5583*) and above El Rincon (*J. 5489*). Like *K. cistoidea*, which grows in ecologically similar situations only 25 km. to the northward, the plant is prostrate. The two species are superficially similar but are readily distinguished since *K. cistoidea* has 5-merous flowers in which 4 stamens and 3 normal petals develop, and *K. iluca* has 4-merous flowers in which only 3 stamens and 2 normal petals develop. *Krameria iluca* is most closely related to *K. triandra* R. & P. of Peru and Bolivia from which it is distinguished by its usually smaller ovate leaves and its abruptly acute petals. The difference in pubescence given by Fries, Nov. Act. Reg. Soc. Sci. Upsal. ser. 4, i. no. 1, 131 (1905), is misleading. Possibly *K. iluca* is no more than a good variety of *K. triandra*. Until the present *K. iluca* has been reported only from high altitudes on the puna of northern Chile and adjacent Argentina. Its occurrence in the coastal hills, hence, is most unexpected.

Hoffmanseggia gracilis (R. & P.) H. & A. Bot. Miscl. iii. 209 (1833); Ph. Fl. Atac. 17 and Viage Des. Atac. 23, 25, 191 (1860). *Larrea gracilis* R. & P. Fl. Peruv. iv. t. 377 (1802), for date see Colmeiro, Los Botánica y Los Botánicos Pen. Hispano-Lusitana 45 (1858).

A prostrate perennial of dryish gravelly soils which is frequent along the coastal plain in our area. It has been collected at ca. 150 m. near Taltal (*Werdermann 813*), between Paso Malo and Cascabeles (*J. 5176*), near Paposo (*J. 5563*), in Quebrada Guanillo near Paposo (*Philippi*), near Ag. Cardon (*J. 5265*) and near Ag. Miguel Diaz (*J. 5350*). I also collected this species at Tocopilla (*J. 3622*) and at Mollendo (*J. 3570*). Hooker & Arnott based their name upon *Larrea gracilis* R. & P. which belongs to the plant of the coastal region about Lima. This seems to be conspecific with our plant and to have a synonym in *H. prostrata* Lag. Hooker & Arnott cite a collection from Coquimbo, *Cuming 880*, but whether this is properly determined I can not say. At Santiago our plant is represented from Chile only by Philippi's specimens from near Paposo. Accordingly I wonder as did also Gay, Fl. Chile ii. 234 (1846), if Cuming's collections could be a form of *H. falcaria* Cav., a species which is not uncommon in that part of Chile.

Lupinus microcarpus Sims, Bot. Mag. 1, t. 2413 (1823).

Werdermann (no. *851*) has collected this lupine at 600 m. alt. in the hills near Taltal.

Melilotus parviflora Desf. Fl. Atlant. ii. 192 (1800); Ph. Fl. Atac. 14 and Viage Des. Atac. 23, 188 (1860).

Reported by Philippi from Agua Perales in Queb. Guanillo near Paposo.

Trifolium concinnum Ph. Fl. Atac. 14 and Viage Des. Atac. 15, 25, 188 (1860).

This beautiful clover is frequent on moist slopes in the fertile belt. It has been collected at Ag. Grande (*J. 5826*), El Rincon (*J. 5494*) and Ag. Miguel Diaz (*J. 5351*). Philippi's type is labeled "Cachinal & Paposo." The species belongs to the group of *T. megalanthum* Steud. and may be no more than a well marked variety. For convenience, however, I am accepting it as distinct since it has a detached natural range, such large flowers, and such a deeply lobed calyx. The species ranges northwards at least to Mollendo, Peru, where it has been reported as *T. polymorphum* Poir. All the plants seen by me produced abundant cleistogamic flowers along the creeping stems.

Lotus subpinnatus Lag. Gen. et Sp. Pl. Nov. 23 (1816); Ph. Fl. Atac. 14 and Viage Des. Atac. 25, 188 (1860).

Collected on the fertile slopes above El Rincon near Paposo (*J. 5495*) and near Taltal (*Werdermann 780*). Philippi reported it from Paposo but his specimens seem to be lost. I also observed the plant on fertile slopes southwest of Cerro Yumbes.

Errazurizia multifoliolata (Clos) Johnston, Proc. Calif. Acad. ser. 4, xii. 1043 (1924); Rydb. Am. Jour. Bot. xv. 427–8 (1928). *Psoralea multifoliolata* Clos in Gay, Fl. Chile ii. 87 (1846). *Dalea multifoliata* F. Ph. Cat. Pl. Vascul. Chile 54 (1881); Reiche, Fl. Chile ii. 77 (1898). *Parosela multifoliolata* Macbr. Contr. Gray Herb. lxv. 23 (1922). *E. glandulifera* Ph. Anal. Univ. Chile xli. 689 (1872).

This remarkable plant, previously known only near Bandurrias (*Geisse*), Carrizal Bajo (*King*) and Arqueros (*Gay*), also occurs in our region on the very arid rocky slopes of the coastal hills near the upper limit of vegetation. It grows in local colonies on the ridges above Ag. Panulcito (*J. 5457*) and El Rincon (*J. 5493*) where it forms prostrate or very loosely decumbent shrubs 1–1.5 m. broad and 5 dm. or less tall. The petals are yellow and the disagreeable odor of the plant quite similar to that of its congeners in Baja California. Although the type of *E. glandulifera* Ph. was not indicated, a study of Philippi's herbarium seems to show that the genus and species were based upon a collection by Gay, no. *9[5 ?]44*, from Arqueros,

probably part of the collection upon which Clos based his *Psoralea multifoliolata.*

Parosela azurea (Ph.) Macbr. Field Mus. Nat. Hist., Pub. Bot. iv. 107 (1927). *Psoralea azurea* Ph. Fl. Atac. 14 and Viage Des. Atac. 23, 25, 188 (1860). *Dalea azurea* Reiche, Anal. Univ. Chile xcvii. 488 (1897) and Fl. Chile ii. 77 (1898).

A loosely branched decumbent bush 1–6 dm. tall and 6–12 dm. broad known only from the upper edge of the fertile belt near Ag. Panulcito (*J. 5456*) and on Cerro Yumbes near Paposo (*J. 5584*) and from a dryish ledge adjacent to Agua Perales in Queb. Guanillo near Paposo where the type was probably obtained by Philippi (*Philippi*, type; *J. 5585*). The standard of the flowers is white, the wings and keel are a rich blue.

Astragalus vasticola, nom. nov. *Phaca atacamensis* Ph. Anal. Univ. Chile lxxxiv. 16 (1893), not *A. atacamensis* Fries (1905).

A small young plant, just coming into flower, collected by San Roman at La Brea in 1884 is the type of *Phaca atacamensis.* What is apparently the same species was found to be common on the gravelly benches about Ag. Cachina (*J. 5739*) and local in moist sand below the water-hole at Ag. Grande (*J. 5824*). The plant is an annual or a short-lived perennial with ascending branches and pinkish flowers. The plant of the Caldera-Copiapó region passing as *A. coquimbensis* (H. & A.) Reiche seems to be conspecific.

Astragalus paposanus, sp. nov., perennis tomentosus canescens 1.5–2.5 dm. altus; caulibus ascendentibus subsimplicibus e radice gracili recta profunda orientibus; rhachi folii 4–10 cm. longa fere ad basem foliolata; foliolis oppositis alternisve 9–15-jugis anguste oblongis 8–16 mm. longis 2–4 mm. latis ca. 0.3 mm. longe petiolulatis apice truncatis et saepe emarginatis; stipulis 3–5 mm. longis 1.5–1.8 mm. latis anguste triangularibus acuminatis distinctis membranaceis maturitate plus minusve recurvatis; pedunculis ascendentibus vel divaricatis 3–8 cm. longis quam foliis brevioribus vel ea paullo superantibus; bracteis lanceolatis vel subulatis deciduis 2–3 mm. longis; floribus laxe racemosis; tubo calycis campanulato 3–4 mm. longo; lobis calycis subulatis 2–3 mm. longis inaequalibus; pedicellis ca. 1 mm. longis; corolla purpureo-rosea; vexillo oblongo-obovato 9–10 mm. longo ca. 4 mm. lato reflexo, lamina basem versus in unguem latum brevem gradatim attenuata apice rotundata saepe emarginata; alis carinam evidenter superantibus, laminis 5 mm. longis ad 2.3 mm. latis oblongis apice rotundis, unguibus linearibus 3.5 mm. longis; carina oblonga 3.5 mm. longa apice rotundata, ungue lineari ad 4 mm. longo; ovario lanceolato compresso dense adpresso-villoso; leguminibus inflatis ellipsoi-

deis vel ovoideis chartaceis 2–3 mm. longis 11–15 mm. crassis sessilibus villosis apicem pedunculi versus congestis ascendentibus vel cernuis ca. 2 mm. longe pedicellatis; seminibus numerosis brunneis nigro-maculatis 3.5 mm. longis 2.5 mm. latis valde compressis oblique ovatis latere juxta hilum conspicue intrusis.—CHILE: dry gravelly floor of Quebrada Guanillo above Agua Perales near Paposo, Dept. Taltal, Dec. 8, 1925, *Johnston 5586* (TYPE, Gray Herb.); dry hard gravel along trail between Paposo and Punta del Rincon, Dept. Taltal, Nov. 30, 1925, *Johnston 5564;* on high dryish ridge above fertile belt, slopes above El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5498*.

This plant was seen only in the general vicinity of Paposo where it grew in dry gravel. It is related to *A. vasticola* Johnston, differing in being conspicuously white-tomentose practically throughout. It is possible that it may be only a northern variety of that species.

Astragalus cachinalensis Ph. Fl. Atac. 15 and Viage Des. Atac. 15, 189 (1860).

A perennial with elongate slender trailing stems which grows in the fertile areas at Ag. Grande (*J. 5825*), Cachinal de la Costa (*Philippi*, type), Ag. Cachina (*J. 5740*), El. Rincon (*J. 5497*), Ag. Panul (*J. 5431*) and Ag. Miguel Diaz (*J. 5349*). The corolla which seems to vary some in size has a cream-colored keel and wings and a bluish standard. The species is unquestionably distinct from *A. procumbens* H. & A.

Astragalus melanogonatus, sp. nov., annuus vel perennis herbaceus vel basem versus suffruticosus 1–2.5 dm. altus ascendens vel prostratus laxe ramosus; ramis gracilibus cum pilis albis adpressis vestitis et inde canescentibus sed sub nodis cum pilis nigris plus minusve fuscescentibus; foliis 4–7 cm. longis canescentibus; foliolis 5–15-jugis 3–15 mm. longis 2–4(–5) mm. latis oppositis vel evidenter alternis 0.2–0.5 mm. longe petiolulatis obovate vel anguste oblongis vel rariter anguste elliptico-oblongis apice truncatis et saepe retusis subtus adpresse villosis supra marginem versus sparse adpresseque villosis sed medium versus saepe subglabris; stipulis membranaceis 3–5 mm. longis paullo ultra medium connatis cum pilis nigris albisque adpresse pubescentibus, laciniis libris triangularibus; racemis axillaribus folia evidenter superantibus strigosis 7–12-floris, bracteis lanceolatis membranaceis 1–1.5 mm. longis villosis subpersistentibus; calycibus cum pilis albis et nigris intermixtis vestitis, tubo campanulato 2.5 mm. longo, lobis subulatis ca. 2 mm. longis, vexillo 0.9–1 cm. lato ca. 0.8 mm. longo suborbiculari caeruleo sed medium et basem versus flavescenti apice retuso basi in unguiculum latum ad 2 mm. longum abrupte attenuato; alis flavis cum ungue 2.5 mm. longis,

laminis ca. 6 mm. longis 3 mm. latis quam carina conspicue longioribus; carina ca. 6 mm. longa apicem versus caerulea alibi flava, lamina 2.5 mm. lata apice rotundata; ovario sessili lanceolato margine superiore dense villoso; leguminibus sessilibus valde compressis falcatis pendulis 1.5–2 cm. longis 4–5 mm. latis acutis pilis nigris albisque adpresso-villosis margine abaxillari introflexis; seminibus ca. 24.—CHILE: dry sandy ridge just back of Punta Reyes below Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5353* (TYPE, Gray Herb.); sandy places at mouth of quebrada at foot of hills just north of Antofagasta, Oct. 19, 1925, *Johnston 3632*.

A very well marked species which is superficially most like *A. Volckmanni* Ph. and *A. Rengifoi* Ph., two species of the Province of Atacama. From these, however, it differs in having smaller differently proportioned blue rather than purple corollas. The most striking features of *A. melanogonatus* are its very compressed fruit and the development of black hairs about the stem-nodes. The two collections referred to the species differ in gross habit but in essential details are remarkably similar. They are, I believe, different ecological phases of the species. The plant from near Antofagasta grew on a very sandy slope northeast of the town where except in such an abnormal winter as that of 1925 and 1926 little or no vegetation is to be found. The plant from Punta Reyes grew on the dunes which normally support a small flora. The specimens from Antofagasta are of an ascending annual with fruit 1.7–2 cm. long and the leaflets 7–15 mm. long in 5–7(–9) pairs. On the other hand the specimens from Punta Reyes are of a prostrate perennial with the fruit ca. 1.5 mm. long and the leaflets 3–6 mm. long in 8–15 pairs. The latter collection, the type, is probably more characteristic of the species.

Adesmia tenella H. & A. Bot. Beechey Voy. 19 (1830). *A. vesicaria* Bert. ex Colla, Mem. Accad. Torino xxxvii. 58 (1831); Ph. Fl. Atac. 15 and Viage Des. Atac. 25, 189 (1860).

An herb which is usually prostrate and grows on gravelly benches below the fertile belt. It has been collected at Taltal (*Werdermann 784*), Ag. Cachinalcito (*J. 5182*), Paposo (*Philippi*), Ag. Cardon (*J. 5264*) and Ag. Miguel Diaz (*J. 5343*). It occurs as far north as Tocopilla (*J. 3623*) and is frequent about Valparaiso and Santiago. I am taking up the name *A. tenella* H. & A. since it is older than the familiar *A. vesicaria* Bert. It might be mentioned that the latter species was obviously based upon a mixture of *A. tenella* H. & A. and *A. Smithiae* DC. although tradition has restricted the use of the name to the present concept.

Adesmia filifolia Clos in Gay, Fl. Chile ii. 157 (1846).

I refer here an erect herb collected on a gravelly bench near Ag. Cachinalcito (*J. 5183*). A loosely branched plant, in flower only, from Taltal (*Werdermann 870*) seems to be the same. The material from Cachinalcito agrees well with authentic specimens of the species, except that only the terminal segment of the fruit bears plumose bristles.

Adesmia pusilla Ph. Fl. Atac. 15 and Viage Des. Atac. 15, 189 (1860).

This slender loosely branched annual is endemic to our area occurring in gravelly places below the fertile belt. It has been collected at Punta de Pan de Azucar (*Philippi*, type; *J. 5843*), various places near Taltal (*Werdermann 830; J. 5086, 5136*), between Agua Dulce and Queb. Anchuña (*J. 5180*) and in Queb. Guanillo near Paposo (*J. 5580*).

Adesmia parviflora Clos in Gay, Fl. Chile ii. 158 (1846). *A. micrantha* Ph. Fl. Atac. 15 and Viage Des. Atac. 189 (1860).

Observed in our area only near Taltal where it was frequent on dryish gravelly benches in Queb. San Ramon (*J. 5135*) and on dryish gravelly openings in the shrubbery on the summit-ridge of Cerro Perales (*J. 5615*).

Adesmia gracillima, sp. nov., prostrata multicaulis sparse strigosa; caulibus tenuissimis herbaceis laxe ramosis 4–7 dm. longis e radice crassa lignosa recta orientibus; rhachi folii 2–5 cm. longa tenui sparse pallideque strigosa basem versus nuda; foliolis 4–6-jugis imparipinnatis ellipticis integerrimis 4–9 mm. longis 2–3.5 mm. latis basi apiceque rotundis ad 0.4 mm. longe petiolulatis subtus strigosis subpallidioribus supra ut videtur glabris sed sub lente minutissime strigulosis; stipulis subulatis erectis persistentibus 1.5–2 mm. longis ca. 0.25 mm. latis; floribus axillaribus; pedunculo 2–2.5 mm. longo gracillimo; tubo calycis breviter campanulato 1.5 mm. lato et longo basi rotundato sparse strigoso, lobis calycis triangularibus tubo subaequilongis paullo inaequalibus; vexillo ca. 4.5 mm. lato 4 mm. longo suborbiculari paullo reflexo flavo cum venis purpureis obscure lineato extus glabro intus basem versus loco villoso ornato sed aliter glabro apice rotundato basi abrupte late 2 mm. longe unguiculato; alis oblongis flavis ad 4 mm. longis ad 1.7 mm. latis apice obtusis carina paullo longioribus, ungue gracili 2.5 mm. longo margine inferiori ciliato; carina falcata ad 4 mm. longa ca. 2 mm. lata flava apice obtusa margine inferiori ciliata aliter glabra, ungue gracili ca. 2 mm. longo; ovario villosulo; leguminibus subsessilibus 3–4-segmentatis 8–12 mm. longis ca. 2.5 mm. latis facie cum pilis rigidis

paucis contortis non plumosis ornatis longe mucronatis.—CHILE: trailing over rocks on the floor of the steep gulch directly above the water-hole at Aguada del Panul, Dept. Taltal, Dec. 4, 1925, *Johnston 5428* (TYPE, Gray Herb.).

An extremely well marked species without any obvious immediate relatives. In gross appearance the plant presents a habit entirely new for the genus. The stems are extremely slender, very numerous, loosely branching and form a prostrate growth nearly 15 dm. in diameter. The flowers are borne on long slender spreading pedicels springing from the axils of well developed leaves along the upper part of the stems. I found only a single plant of the species. It was in the moist fog-bathed gulch at Ag. Panul.

Adesmia eremophila Ph. Fl. Atac. 15 and Viage Des. Atac. 12, 15, 189 (1860).

A frequent plant in dryish gravel below the fertile belt. It is an annual or less commonly a perennial and forms prostrate growths up to nearly a meter in diameter. The corolla is yellow with the outer surface frequently somewhat brownish. Philippi reported the plant from Las Animas, Cachinal de la Costa and Chañaral Bajo. The only material in Philippi's herbarium collected by him at any one of these stations is a plant given as from Chañaral Bajo (i. e. Finca de Chañaral) and this specimen I accept as type. I collected the species at Ag. Grande (*J. 5828*), near Taltal (*J. 5087, 5137*), near Paposo (*J. 5487, 5581*), near Ag. Miguel Diaz (*J. 5342*), and near Botija (*J. 6295*). Except no. *5487* which came from an arid ridge-crest above El Rincon all the collections came from low altitudes. The plant from the Caldera-Copiapó region which has been called *A. latistipula* Ph. appears to be indistinguishable from *A. eremophila*.

Adesmia viscidissima, sp. nov., suffruticosa dense viscido-villosa; caulibus pluribus laxe ascendentibus 1.5–7 dm. longis saepe laxe dichotome ramosis annuis e radice crassa lignosa recta orientibus; rhachi folii 3–5.5 cm. longa compressa basem versus nuda; foliolis imparipinnatis 11–14-jugis imbricatis 6–12 mm. longis 4–9 mm. latis subsessilibus obovatis apice obtusis vel rotundis superioribus gradatim diminutis; stipulis conspicuis ellipticis 8–13 mm. longis 5–8 mm. latis in petiolo 3–7 mm. longe adnatis; floribus subsessilibus in racemum terminalem 1–1.5 dm. longum conspicue bracteatum dispositis; bracteis cordatis amplexicaulibus 6–11 mm. latis breviter acuminatis; tubo calycis vere campanulato 3–4 mm. longo, lobis calycis valde inaequalibus erectis obtusis, 2 superioribus oblongis ad 4 mm. longis ca. 1.8 mm. latis, 3 inferioribus lineari-oblongis ca. 3.2 mm. longis ca. 1 mm. latis; vexillo transverse ovato-elliptico 6–7 mm. longo 8–9 mm.

lato glaberrimo flavo conspicue purpureo-maculato et -venoso apice rotundo, ungue ad 3 mm. lato apicem versus loco villoso ornato; alis oblique obovatis ad 5 mm. longis 3.5 mm. latis flavis glaberrimis carinam 1 mm. superantibus apice rotundis, ungue lineari 3 mm. longo; carina falcato-triangulari flava apice obtusa margine inferiori horizontali ca. 3 mm. longa ciliata, margine exteriori erecto 3.5–4 mm. alto glabro, ungue ca. 3 mm. longo; ovario adpresse villoso; leguminibus linearibus ca. 1 cm. longis 3 mm. latis ca. 4-segmentatis facie cum pilis 5 mm. longis gracillimis plumosis densissime obsitis; seminibus globosis ca. 1.5 mm. diametro laevibus.—CHILE: arid crest of ridge above the fertile belt near El Rincon, Dept. Taltal, Dec. 7, 1925, *Johnston 5490* (TYPE, Gray Herb.).

This remarkable species was encountered only on the very arid ridge-crest above El Rincon near Paposo, where, well above the fertile belt, it formed a small colony in the decomposed rock on the nearly barren summit. It is a strong-rooted perennial with laxly ascending stems and is excessively viscid with a very oily villous pubescence. Because it is so very clammy it is a very unpleasant plant to handle. The oily viscid secretions come from small brown glands submerged in the epidermal tissue. The stems are clothed with a sparse long-villous pubescence and a very much more abundant short-villous pubescence which on the younger parts of the stem is almost velutinous. The leaves are appressed-villous. The species is probably most nearly related to *A. eremophila* Ph. from which it differs in numerous characters, but particularly in its coarser habit, strong root, different pubescence, subsessile calyx, glabrous vexillum, entire-margined larger leaflets and bracts, etc.

Adesmia cinerea Clos in Gay, Fl. Chile ii. 179 (1846); Ph. Fl. Atac. 16 and Viage Des. Atac. 12, 190 (1860).

Philippi reports this distinctive shrub from near Las Animas. I have not seen his specimens.

Adesmia Diaziana, sp. nov., fruticosa intricate ramosa ca. 1.2 m. alta; ramis gracilibus adpresse villosulis vetustate glabratis et nigrescentibus supra dichotome spinosis; spinis gracilibus 1–2 cm. longis; rhachi folii 1–2 cm. longa tereti adpresse villosula; foliolis paripinnatis 4–6-jugis obovatis vel ellipticis 2–4 mm. longis 1.5–2.5 mm. latis emarginatis brevissime petiolulatis sparse adpresse villosulis; stipulis brunneis lanceolatis caducis erectis 1.5–2 mm. longis 0.3 mm. latis; floribus in axillis solitariis pluribusve vel non rariter in racemum pauciflorum spinescentem dispositis; pedicellis gracilibus 3–8 mm. longis dense adpresse canescenti-villosulis; tubo calycis late campanulato ca. 2.5 mm. longo sparse adpresse villosulo; lobis calycis

tubo brevioribus subulatis 1–2 mm. longis inaequalibus; vexillo transverse elliptico ca. 8 mm. longo 11 mm. lato paullo emarginato flavo conspicue brunneo-venosis glabro, ungue 3 mm. longo ad 1.5 mm. lato extus minute villosulo intus apicem versus cum loco arcuato dense villoso; alis oblongis flavis brunneo-venosis ad 6 mm. longis 3 mm. latis glaberrimis carinam 1 mm. superantibus, ungue lineari ca. 3.5 mm. longo; carina late falcata ad 6 mm. longa 4 mm. lata acuta pallida margine inferiori ciliato, ungue lineari 3 mm. longo; ovario villoso; leguminibus ca. 1.7 cm. longis 6 mm. latis ca. 4-segmentatis facie cum pilis 7 mm. longis gracilibus plumosis dense obsitis.—CHILE: rocky slopes above Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5352* (TYPE, Gray Herb.).

An infrequent bush on the dryish rocky slopes just above the fertile belt on the ridge back of Punta Reyes near Ag. Miguel Diaz. The plant is related to *A. melanocaulos* Ph., which occurs from Taltal southward to Ag. Grande, but differs in having flowers twice as large, longer calyx-lobes, canescent pedicels and slightly larger leaves. It is possible that we are concerned here with only a well defined variety of that species.

Adesmia melanocaulos Ph. Anal. Univ. Chile lxxiv. 434 (1893).

The type of this species is a mere snip collected by Larrañaga at Breas. What seems to be clearly the same species was collected on the foggy cliffs near Ag. Cachina (*J. 5741*) and Ag. Grande (*J. 5827*) where it grew flattened against the cliff forming dense intricate shrubby masses 6–12 dm. broad and ca. 3 dm. tall. I doubtfully also refer to the species a plant from the dry rocky slopes above Agua Lora on Cerro Perales near Taltal (*J. 5616*). This is a large bush 1–1.5 m. tall with the leaves and youngest stems gray with a dense appressed-villous pubescence and somewhat glandular as well. A plant from dry gravelly benches and talus just south of Posada Hidalgos (*J. 5660*) is very glandular throughout but otherwise seems to be similar to *A. melanocaulos*.

Adesmia intricata Ph. ex Reiche, Anal. Univ. Chile xcvii. 735 (1897) and Fl. Chile ii. 124 (1898).

I doubtfully associate the above name with a low intricate stiff cinerous bush 6–12 dm. broad and 3–6 dm. tall, which was locally common in a dry sandy shallow quebrada about a kilometer back from the sea-cliffs near Ag. Grande (*J. 5742*). The same species also occurs near Caldera where I have seen collections by Gigoux, Morong (no. *1171*) and Rivero (no. *1791*). The type of *A. intricata*, given as from Caldera, I could not find at Santiago. I did find a plant from Huasco so determined by Philippi, but that plant does not agree with

Reiche's description. The plants I have cited above also differ from Reiche's diagnosis of *A. intricata*, having rather stiff nqt particularly slender spines, a dense almost tomentose appressed pale villous pubescence on the leaves and younger parts, and trichomes on the fruit 6–8 mm. long. Reiche has determined Gigoux's collection as *A. calapogon* Ph., which is obviously incorrect. Morong's collection bears the name *Adesmia furcata* Ph.

Vicia vicina Clos in Gay, Fl. Chile ii. 138 (1846). *V. paposana* Ph. Fl. Atac. 15 and Viage Des. Atac. 25, 189 (1860).

Philippi's species, *V. paposana*, the type of which came from the fertile belt near Paposo, appears to represent merely a phase of *V. vicina* Clos. The species is not known otherwise from northern Chile.

Vicia modesta Ph. Fl. Atac. 15 and Viage Des. Atac. 25, 189 (1860).

This species is known only from Paposo (*Philippi*, type), El Rincon near Paposo (*J. 5496*) and Ag. Panul (*J. 5429*) where it grows on moist rich slopes in the fertile belt. It is a slender glabrous annual with scarcely climbing slender stems 2–6 dm. long and small solitary and axillary blue flowers.

Lathyrus magellanicus Lam. Encyc. ii. 708 (1788).

What is apparently a variety of this species was found trailing over the rocks in the fog-bathed gulch immediately above the water-hole at Ag. Panul (*J. 5430*). The foliage is glabrescent or finely short-villous. The corolla is purple.

GERANIACEAE

Erodium cicutarium L'Hér. ex Aiton, Hort. Kew, ed 1, ii. 414 (1789); Ph. Fl. Atac. 12 and Viage Des. Atac. 186 (1860). *E. moschatum* of Ph. Viage Des. Atac. 25, 27 (1860).

An herb frequent in the fertile belt. Philippi reports it from near Paposo and Miguel Diaz. I have characteristic fragments from Taltal, Punta Grande and Ag. Miguel Diaz.

Balbisia peduncularis (Lindl.) Don, Edinb. New Philos. Journ. xi. 277 (1831). *Ledocarpum pedunculare* Lindl.; Ph. Fl. Atac. 12 and Viage Des. Atac. 15, 18, 24, 25, 186 (1860).

A bush 1–2 m. tall growing on hillsides or along dry stream-ways in the quebradas and bearing large golden-yellow corollas. It has been collected at Cachinal de la Costa (*Philippi*), Breas (*Larrañaga*), near Taltal (*Werdermann 80*, *J. 5069*) and above the fertile belt above El Rincon (*J. 5512*). This northern form of *B. peduncularis* is more slender than the typical form from Coquimbo and has less well developed bracts.

OXALIDACEAE

Oxalis caesia Ph. Fl. Atac. 13 and Viage Des. Atac. 23, 25, 187 (1860).

The type of this remarkable species was collected by Philippi near Agua de Arriba (now called Posada) in Queb. Guanillo near Paposo. I made a collection at that station and found it locally common there on the dry gravelly floor of the quebrada (*J. 5593*). I also collected it on the high dry ridge above El Rincon where it grew in decomposed rock well above the fertile belt (*J. 5522*). The plant is perennial with the slender prostrate fruticulose stems and glaucescent leaves forming pallid mats 5–20 cm. in diameter. Reiche, Bot. Jahrb. xlv. 347 (1911), reports it from the arid interior near Guamango.

Oxalis sp. nov., Knuth, in lit.

A prostrate plant very closely related to *O. caesia* and perhaps only a robust phase of it. It was observed only above Ag. Panulcito (*J. 5466*) where it was rare and local in decomposed rock on the very arid ridge-crest near the upper limit of vegetation.

Oxalis fruticula Ph. Fl. Atac. 13 and Viage Des. Atac. 23, 25, 187 (1860).

The type and only known collection of this species was made near Agua de Arriba in Queb. Guanillo near Paposo by Philippi. I did not find the plant at the type station. The plant belongs to the same group as the last two species and is immediately related to them differing from *O. caesia* in its less pale spathulate-cuneate leaflets.

Oxalis micrantha Bertero ex Colla, Mem. Accad. Torino xxxvii. 50 (1831).

Collected at ca. 300 m. alt. near Taltal by Werdermann (no. *827*).

Oxalis breana Ph. Anal. Univ. Chile lxxxii. 1096 (1893).

The type was collected near Breas by Larrañaga. It is sparsely villous. I associate with it a collection from the fertile belt near Ag. Miguel Diaz (*J. 5401*). This material is completely glabrous and is slightly glaucescent but is otherwise similar to the type. *Oxalis bulbocastanum* Ph. from Caldera is very closely related to *O. breana* differing from it chiefly in its smaller corollas.

Oxalis thyrsoidea Reiche, Bot. Jahrb. xviii. 287 (1894).

Known only from near Taltal where it has been collected by Borchers (type) and by Werdermann (no. *770*). It is very closely related to *O. breana* of which it may be only a form differing in its more narrow outer sepals and perhaps narrower and more blue-marked petals.

Oxalis atacamensis Reiche, Bot. Jahrb. xviii. 286 (1894). *O.*

trichocalyx Ph. Fl. Atac. 13 and Viage Des. Atac. 25, 187 (1860), not Steud. (1856).

Known only from the type, a very slender glandular plant collected near Paposo by Philippi. Reiche, Bot. Jahrb. xlv. 347 (1911), reports it from near Ag. Perales in Queb. Guanillo near Paposo.

Oxalis sp. nov., Knuth, in lit.

On a moist slope in the fertile belt near Ag. Miguel Diaz (*J. 5400.*) This material is obviously related to *O. atacamensis* and may be only a phase of it differing in being coarser throughout and more densely and coarsely pubescent and in having larger oblong evidently obtuse sepals. The herbage is dark and extremely glandular. A collection made at Bandurrias by Geisse seems to be quite the same.

Oxalis paposana Ph. Fl. Atac. 13 and Viage Des. Atac. 25, 27, 187 (1860). *O. Borchersi* Ph. Anal. Univ. Chile lxxxii. 1096 (April, 1893), not Ph. l. c. 905 (March, 1893). *O. Darapskyi* Ph. ex Reiche, Bot. Jahrb. xviii. 288 (1894).

Growing in rocky places usually outside of the fertile belt. It commonly develops a slender erect fruticulose caudex which arises from the irregularly much thickened underground parts. The root of the *Oxalis* illustrated by Reiche, Bot. Jahrb. xlv. 344, fig. 1 (1911), is characteristic of this species and *O. ornata* Ph. The plant has been collected on the slopes near Barquito (*J. 4783, 6293*), on a rocky crest just back of the sea-cliffs near Ag. Grande (*J. 5782*), near Taltal (*Borchers*, type of *O. Borchersi* and *O. Darapskyi*), on terraces near the ocean between Cachinalcito and Queb. Tunas (*J. 5181*), near Paposo (*Philippi*, type of *O. paposana*), on slopes above the fertile belt on Cerro Yumbes near Paposo (*J. 5559*), in rocky places on Punta Plata (*J. 5248*) and just below the fertile belt on a dryish slope back of Punta Reyes near Ag. Miguel Diaz (*J. 5402*). It is the most common species in our area. The type of *O. Borchersi* Ph. is labeled as from Taltal and not as from Paposo as given in the original description. Some of my material from near Barquito (*J. 4783* in pt.) has the sepals conspicuously strigose. The other collections have glabrate or inconspicuously pubescent sepals.

Oxalis ornata Ph. Fl. Atac. 13 and Viage Des. Atac. 15, 25, 187 (1860).

Known only from crevices on the sea-cliffs near Ag. Cachina (*J. 5708*), near Paposo (*Philippi*, type), on sides on the quebrada near Ag. Miguel Diaz (*J. 5398*) and on a dryish rocky slope just below the fertile belt back of Punta Reyes near Ag. Miguel Diaz (*J. 5399*). Philippi reports it from Cachinal de la Costa. The species differs from *O. paposana* in its larger rich-yellow corollas, larger less retuse leaflets, very pubescent pedicels and lower habit.

Oxalis ornithopus Ph. Fl. Atac. 13 and Viage Des. Atac. 15, 187 (1860).

Philippi collected the type of this species between Caleta de Pan de Azucar and Cachinal de la Costa. I obtained material which is clearly conspecific on a dry gravelly ridge just above the fertile belt at El Rincon (*J. 5521*). My collection has a slender rhizome with tuberous thickenings and erect simple fruticulose stems 1–15 cm. long. The leaflets are rounded at the apex.

Oxalis gigantea Barn. in Gay, Fl. Chile i. 433 (1845); Ph. Fl. Atac. 13 and Viage Des. Atac. 14, 15, 25, 187 (1860).

A shrub 1–2 m. tall with long strict branches. It was collected only on the sea-cliffs near Ag. Cachina (*J. 5709*) but was noted on Cerro Perales near Taltal and on slopes near El Rincon, Ag. Panulcito and Ag. Miguel Diaz. It was not abundant. Philippi reports it from just north of Chañaral and from near Cachinal de la Costa, and Paposo. Reiche, Bot. Jahrb. xlv. 344 (1911), reports it from back of Chañaral.

Oxalis bicruralis Reiche, Bot. Jahrb. xlv, 347 (1911).

A nomen subnudum applied to material from about Ag. Perales in Queb. Guanillo near Paposo by Reiche who speaks of the plant only as follows, "*O. bicruralis* R., eine vermutlich neue Art mit tiefgespaltenen Teilblättchen, deren schmale Lappen fast senkrecht zu einander stehen." The mention of cleft leaflets suggests that the plant might be a form of *O. paposana*. I found no specimens of the plant at Santiago.

TROPAEOLACEAE

Tropaeolum tricolor Sweet, Brit. Fl. Gard. iii. t. 270 (1828).

Climbing on cactus and through bushes along the lower edge of the fertile belt. It is not common and has been collected only at Taltal (*Borchers, Werdermann 828*), Puerto Oliva (*Borchers*), Punta Grande (*J. 5235*) and Ag. Panul (*J. 5439*). Reiche, Bot. Jahrb. xlv. 346 (1911), reports it from the hills near Chañaral.

LINACEAE

Linum paposanum Ph. Fl. Atac. 13 and Viage Des. Atac. 25, 187 (1860).

A very loosely branched fruticulose perennial which is infrequent in the fertile belt. It is known only from Paposo (*Philippi*, type), El Rincon (*J. 5527*), Ag. Panul (*J. 5438*) and Ag. Miguel Diaz (*J. 5397*).

Linum cremnophilum, sp. nov., perenne vere prostratum fruticulosum 3–5 cm. altum 1–4 dm. diametro glaberrimum; ramis numerosis alternis ramosissimis, vetustioribus cortice crasso pallido conspicue irregulariterque rimoso suberoso vestitis, juvenalibus 5–10 cm. longis gracilibus subprostratis foliosis costatis; foliis basem versus ramuli alternis, ceteris oppositis lanceolatis vel ellipticis vel oblongo-oblanceolatis 4–7(–8) mm. longis 2–4 mm. latis plus minusve pallidescentibus acutis vel obtusis costatis sed enervatis margine paullo incrassatis et inconspicue minuteque papillatis basem versus attenuatis biglandulosis; floribus in apice ramulorum solitariis vel in circinnis 2–3-floris dispositis; pedicellis 0.2–1 mm. longis; sepalis 3-nerviis 2.5–3 mm. latis glabris lanceolato-ovatis vel subellipticis apicem versus acutis vel rotundis acuminatis; petalis luteis (in sicco pallidescentibus) obovatis quam sepalis 3–4-plo longioribus 0.8–1 cm. longis 5–8 mm. latis apice rotundis vel emarginatis basi acutis et subunguiculatis; stylis 7 mm. longis in tubo connatis vel apice saepe ca. 1 mm. rarissime usque ad 4 mm. libris; capsula depresse globosa 3.5 mm. diametro apicem versus brunnescenti; seminibus nitidis oblique ellipticis 2.3 mm. longis 1.2 mm. latis.—CHILE: crevices at head of foggy sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5781;* crevices at head of fog-bathed sea-cliffs near Aguada Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5707* (TYPE, Gray Herb.).

A very distinct species which is known only from crevices about the head of the line of high fog-bathed sea-cliffs near Ag. Grande and Ag. Cachina. It is a decidedly prostrate shrubby perennial with bright yellow corollas. In having its styles connate to or beyond the middle it agrees with *L. Macraei* Benth. and is probably most nearly related to that species. It differs, however, in its prostrate more freely branched habit, smaller and proportionately broader leaves, slightly smaller petals and very detached range.

ZYGOPHYLLACEAE

Fagonia chilensis H. & A. Bot. Miscl. iii. 165 (1833).

Frequent in dryish gravelly soils. It has been collected in our area at Barquito (*J. 4782*), Ag. Grande (*J. 5780*), Ag. Cachina (*J. 5706*), Sierra Esmeralda (*San Roman*), Breas (*Larrañaga*), Taltal (*J. 5163*) and on Cerro Yumbes near Paposo (*J. 5558*). The material from Barquito and the Sierra Esmeralda is scabrous and is, hence, referable to the var. *asper* (Gay) Johnston, Proc. Calif. Acad. ser. 4, xii. 1051 (1924).

MALPIGHIACEAE

Dinemandra ericoides Juss. Ann. Sci. Nat. ser. 2, xiii. 255 (1840). *D. strigosa* Ph. Fl. Atac. 12 and Viage Des. Atac. 24, 25, 186 (1860).

A prostrate herb or suffruticose plant frequent in gravelly situations below the fertile belt. It has been collected near Taltal (*Borchers, J. 5081*), Breas (*Larrañaga*), Queb. San Ramon (*J. 6297*), Paposo (*Philippi*, type of *D. strigosa*), Queb. Guanillo near Paposo (*J. 5592*), Punta Buitre (*J. 5240*) and Ag. Cardon (*J. 5280*). Further north it is known from Antofagasta (*J. 3647*) and from Cobija, the type locality for *D. ericoides*. Niedenzu, Pflanzenr. [Heft 91] iv. Fam. 141, pt. 1, 234 (1928), reports it from Queb. Matancilla.

Niedenzu, l. c., has broken the genus up into two groups determined by the number of anthers matured. Typically *D. ericoides* and *D. strigosa* develop two fertile stamens. My collections from Queb. San Ramon and Queb. Guanillo, however, have flowers developing three fertile stamens quite as in *D. glaberrima* Juss., a species which appears always to mature three fertile stamens. Except for these staminal aberrations, however, the two collections mentioned are quite similar to the other collections cited above and I believe are certainly conspecific with them. In my collection from Antofagasta the flowers show every degree of development in the third anther and in the filament as well. It must be clear, therefore, that the number of fertile stamens produced is not invariably diagnostic even as a specific character. *Dinemandra ericoides* is distinguished from the other species of the genus, *D. glaberrima*, by its conspicuous appressed villous pubescence, usually 2 rather than 3 fertile stamens and northern distinct range.

Dinemandra glaberrima Juss. Arch. Mus. Paris iii. 583 (1843). *D. ramosissima* Ph. Fl. Atac. 12 and Viage Des. Atac. 186 (1860). ? *D. subaptera* Ph. l. c.

Infrequent on gravel at the mouth of a quebrada near Barquito (*J. 4781*). Reiche, Bot. Jahrb. xlv. 347 (1911), reports it also from the interior between Guamango and Las Animas. My collection is quite similar to the common form of the species found in the Caldera-Copiapó region. Despite its specific name the plants of this species are usually not completely glabrous since a few inconspicuous villous hairs are frequently to be found on the pedicels and bracts and in the upper axils. The species becomes more shrubby than *D. ericoides* and is more southern in its range.

EUPHORBIACEAE

Croton chilensis Müll. Arg. Linnaea xxxiv. 92 (1865) and DC. Prodr. xv. pt. 2, 540 (1866). *C. collinus* Ph. Fl. Atac. 49 and Viage Des. Atac. 24, 26, 223 (1860); not HBK. (1817).

A loosely branched erect shrub 5–15 dm. tall growing in dryish gravelly places along the edge of the fertile belt. It is known only from our area where it has been collected on slopes in Queb. Guanillo near Paposo (*Philippi*, types), El Rincon near Paposo (*J. 5519*), about rocks near Ag. Cardon (*J. 5279*) and on slopes above Ag. Miguel Diaz (*J. 5395*).

Chiropetalum canescens Ph. Fl. Atac. 49 and Viage Des. Atac. 26, 223 (1860). *Argyrothamnia Sponiella* Müll. Arg. Linnaea xxxiv. 148 (1865). *C. Sponiella* Pax in E. & P. Nat. Pflanzenf. iii. Abt. 5, 45 (1890).

Growing in dryish places usually between rocks and commonly forming strict tufts of stems 1–3 dm. tall. It was observed both above and below the fertile belt. Collections have been made at Barquito (*J. 4780*), Ag. Grande (*J. 5778*), near Taltal (*Werdermann 773*, *J. 5079*), Hueso Parado (*Philippi*, type of *C. canescens*), Cerro Perales near Taltal (*J. 5613*, *5614*) and Ag. Panulcito (*J. 5465*). The material from Cerro Perales and Philippi's type, which probably came from the slopes of the same peak, are more canescent and have a denser pubescence than the other collection cited. They represent, however, merely an extreme phase of the species connected by obvious transitions to the common, sparsely pubescent forms. The type of *C. Sponiella*, which came from Cobija, is one of these latter.

Chiropetalum cremnophilum, sp. nov., fruticulosum viride; caulibus gracilibus erectis vel decumbentibus 5–25 cm. longis angulatis glaberrimis e rhizomate ramoso lignoso 5–20 cm. longo erumpentibus; foliis ovatis vel ellipticis alternis 1–2 cm. longis 7–13 mm. latis integerrimis margine excepto glaberrimis apice obtusis, basi in petiolum 1–2 mm. longum abrupte contractis rotundis vel subcordatis nerviis infimis 3 vel rariter 5 ultra medium laminae productis, margine extremo pilis malpighiaceis sparsis ornatis; stipulis fere ad 0.7 mm. longis cuneatis vel triangularibus crassis; racemis 0.5–1 cm. longis bisexualibus 3–7-floris 7–22 mm. longe pedunculatis, rhachi et pedunculis glabris vel cum pilis malpighiaceis sparsissime ornatis; bracteis ovatis ca. 0.5 mm. longis sparse brevissimeque ciliolatis; floribus masculinis pluribus, sepalis 2 mm. longis late lanceolatis acutis extus cum pilis malpighiaceis sparse ornatis, petalis calyce evidenter brevioribus divergente tripartitis 1.5 mm. longis, glandulis

disci glabris truncatis, staminibus 5; floribus femineis ad basem racemi solitariis cernuis, pedicellis 1–2 mm. longis saepe cum pilis malpighiaceis ornatis, sepalis 2 mm. longis lanceolatis acuminatis extus apicem versus non rariter cum pilis malpighiaceis ornatis, petalis anguste lanceolatis integris ca. 0.8 mm. longis, glandulis disci majusculis truncatis glabris, styli lobis ultra medium partitis, capsula 4 mm. diametro 2 mm. alta depresso-trigyna cum pilis malpighiaceis vestita, seminibus globosis brunnescentibus glaucis 1.5 mm. diametro laevibus.—CHILE: about head of fog-bathed sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5779* (TYPE, Gray Herb.); about head of foggy sea-cliffs near Aguada Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5705.*

In gross habit extremely similar to *C. Berterianum* Schlecht. of the Santiago-Valparaiso region, but, as shown by floral characters, obviously most closely related to the habitally very dissimilar *C. canescens* Ph. of our area. From *C. canescens* it differs in its dark green herbage, very sparse malpighiaceous pubescence, loose decidedly stoloniferous habit and slender usually decumbent stems. It differs from *C. Berterianum* in having truncate glabrous floral glands, a sparser unmixed pubescence, and few-flowered racemes. The new species is known only from the sea-cliffs near Ag. Grande and Ag. Cachina where it grows in rock-crevices or in rocky places about the foggy crest of the cliffs. The herbage is dark green. The plant is much too violent a departure from *C. canescens* to be an ecological form of that species. It is also to be noted in this regard that *C. canescens* was collected a short distance back of the fertile foggy cliff-head.

Euphorbia minuta Ph. Cat. Pl. Itin. Tarapacá 76 (1891).

The type of this species was collected by Rahmer in Jan. 1886 at Calcalhuay, lat. 19° 48′ S., at 3700 m. alt. on the puna near the Chile-Bolivian boundary. Material matching the type very closely was obtained in disturbed dry soil just above the fertile belt above El Rincon (*J. 5518*) and just below the crest of Cerro Yumbes (*J. 5556*). The plant is a glabrous annual with slender reddish branches 2–8 cm. long and is prostrate.

Euphorbia porphyrantha Ph. Anal. Univ. Chile xci. 510 (1895).

This species has been collected at ca. 100 m. alt. near Taltal by Werdermann (no. *816*). It is otherwise known only from Finca Chañaral (type), Bandurrias and Huasco.

Euphorbia thinophila Ph. Anal. Univ. Chile xliii. 537 (1873).

A small colony of this species was found in dry gravel and talus in the Sierra Esmeralda north of Portezuelo de Mina Carola (*J. 5678*).

The dark colored stems are decumbent and come from a fleshy fusiform root which is loosely set in the ground. The species is otherwise known only from the type collected over 50 years ago on the coast at Huasco. It appears to differ from *E. porphyrantha* only in having the leaves linear-lanceolate and 2–4 mm. broad rather than ovate and 7–18 mm. broad. These differences, however, seem to be decisive.

Euphorbia copiapina Ph. Fl. Atac. 49 and Viage Des. Atac. 223 (1860). *E. calderensis* Ph. Anal. Univ. Chile xci. 510 (1895).

Collected on the dunes at Caleta de Pan de Azucar (*J. 5838*) and observed in abundance on the dunes on the large point of land just north of Chañaral. The stems are prostrate on the sand and spring from a large fleshy shallowly buried bottle-shaped root. The leaves are rounded or obtuse and have crisped margins and are not acute as in the two preceding species. The species has been frequently collected in the region about Caldera. Otherwise it is known only from Monte Amargo (*F. Philippi*) Chañarcillo (*Philippi*) and Bandurrias (*Geisse*) in the area back from the coast.

Euphorbia lactiflua Ph. Fl. Atac. 48 and Viage Des. Atac. 14, 15, 16, 19, 20, 24, 26, 27, 222 (1860).

This is the predominating and characteristic plant of the fertile belt throughout our area. It is a very lactiferous shrub 1–2.5 m. tall. It was collected only at Barquito (*J. 4778*) and at Ag. Cardon (*J. 5278*). For further notes see Reiche, Bot. Jahrb. xlv. 349–353, fig. 5–7 (1911).

CALLITRICHACEAE

Callitriche turfosa Bertero ex Hegelm. Monog. Callitriche 59, t. 3, fig. 4 (1864).

Growing in and about the margin of the small water-hole at Agua Dulce (*J. 5187*). This water-hole is situated among the rocks at the foot of a cliff very close to the ocean and scarcely above high-tide level. As the name suggests the water is fresh. I have compared my collection with specimens of the original collection by Bertero, with which it agrees in the important details. I have not gone into the validity of *C. turfosa* or attempted to determine its precise relationship.

SAPINDACEAE

Llagunoa glandulosa (H. & A.) Don, Gen. Syst. i. 673 (1831).

Of this species one bush was encountered on a rocky ledge in the dryish shrubby area above the fertile belt near the crest of Cerro Yumbes just east of Paposo (*J. 5557*). The plant is quite typical of

the species although it represents a northerly range extension (from Coquimbo) of about 600 km.

MALVACEAE

Palaua concinna (Ph.), comb. nov. *Sida concinna* Ph. Fl. Atac. 12 and Viage Des. Atac. 25, 186 (1860).

A fruticulose perennial of the fertile belt which has been collected at Ag. Cachinalcito (*J. 5186*), Paposo (*Philippi*, type), El Rincon (*J. 5501*), Ag. Cardon (*J. 5269*) and Ag. Miguel Diaz (*J. 5364*). The corolla is a rose-pink and is borne on slender erect or ascending branches. The species has been considered as indistinguishable from *P. moschata* Cav. of the coast of central Peru. It differs from that species, however, not only in its greatly detached range but in its slender erect or ascending stems, noticeably denser tomentum and short petioles. The petioles of *P. concinna* at most equal the length of the blades and are usually distinctly shorter. Usually the pedicels clearly surpass the subtending leaf. *Palaua velutina* Urb. & Hill, from Tacna, to judge from description, seems to be very closely related to *P. concinna*.

Palaua modesta (Ph.) Reiche, Anal. Univ. Chile xci. 363 (1895) and Fl. Chile i. 215 (1896). *Sida modesta* Ph. Fl. Atac. 12 and Viage Des. Atac. 25, 186 (1860).

An herb developing a definitely perennial root. The stems are at first erect but become decumbent or prostrate. It grows in the fertile belt and has been collected at Ag. Cachinalcito (*J. 5185*), Paposo (*Philippi*, type), El Rincon (*J. 5500*) and Ag. Miguel Diaz (*J. 5362*). The corolla is small and white.

Palaua dissecta Benth. Jour. Linn. Soc. vi. 101 (1862). *P. bipinnatifida* Reiche, Anal. Univ. Chile xci. 363 (1895) and Fl. Chile i. 215 (1896), a slip for *P. dissecta ?*

A single colony of what is apparently a form of this species was encountered on a dry rocky bench at the mouth of the quebrada below Ag. Miguel Diaz (*J. 5363*). The specimens differ from the Peruvian forms referable to the species in being erect with a single loosely branched stem and in having petals only 1 cm. long. The petals are purplish-pink. The type of *P. dissecta* Benth. is a mixture consisting of a plant with dissected leaves, the type in the restricted sense, and a plant with entire leaves which seems to be referable to *P. rhombifolia* Graham. The label associated with the type is a printed one of Cuming's giving the source as "Cobija, Iquiqui et Arica."

Malvastrum Hinkleyorum Johnston, Contr. Gray Herb. lxx. 73 (1924).

Growing in open places on gravelly benches at mouths of quebradas below the fertile belt near Ag. Cardon (*J. 5268*) and Ag. Miguel Diaz (*J. 5361*). It is an erect slender annual herb with white petals that are purplish at the base. The material from our area has the stems minutely stellate, rather than glabrous, but otherwise is remarkably like the type of the species. The species, originally described from Arequipa, has been confused with *M. peruviana* but differs in having smaller flowers, pale corollas, more slender habit, larger more conspicuous stipules and very deeply lobed or divided leaves. *Malva scorpioides* Turcz. (1863), not *Malvastrum scorpioides* Schum. (1900), seems to be a phase of it.

Malvastrum peruvianum (L.) Gray, Bot. U. S. Explor. Exped. 146 (1854). *Malva peruviana* L. Sp. Pl. 688 (1753). *M. limensis* L. Amoen. Acad. iv. 325 (1756); Ph. Fl. Atac. 11 and Viage Des. Atac. 25, 185 (1860).

Seen twice, once on an open grassy crest in the fertile belt on the ridge back of Punta Grande (*J. 5215*) and again about the mouth of the quebrada below Ag. Miguel Diaz (*J. 5360*). At the latter station it grew with *M. scorpioides*. The corolla is pink. Philippi collected the species at Paposo.

Cristaria leucantha, sp. nov., perennis paullo fulvescens; caulibus pluribus saepe prostratis sed rariter suberectis vel laxe ascendentibus gracilibus usque ad 8 dm. longis ascendenter breviterque ramosis pilis stellatis sparsis evanescentibus etiam aliis multicellularibus simplicibus numerosis inconspicuis glanduliferis ornatis, caudice fruticuloso prostrato ramoso erumpentibus, internodiis medialibus 3–6 cm. longis; foliis cum pilis stellatis subvelutinis, infimis caulum ramorumque ellipticis vel ovato-ellipticis 1–2.5 cm. longis 8–16 mm. latis basi apiceque rotundis margine sparse lateque pinnato-lobatis vel obscure trilobatis, ceteris paullo ultra medium laminae evidenter trilobatis ambitu ovatis vel deltoideo-ovatis apicem versus caulis gradatim diminuentibus, inferioribus 2.5–4 cm. longis et 3–4.3 cm. latis, superioribus 1.5 cm. longis vel minoribus basi reniformibus vel truncatis, lobo mediali evidenter majori in lobulos 1–2-jugatos rotundos latos subimbricatos 1–5 mm. profunde lobato oblongo vel ovato-oblongo apice rotundo, lobis lateralibus ascendentibus irregulariter sparseque lobatis, petiolo lamina saepe breviori sed rariter paullo longiori pilos stellatos etiam alios glanduliferos gerenti; stipulis 5–7 (–12) mm. longis 0.8–1.2(–3) mm. latis oblongis vel oblanceolatis rotundis vel obtusis stellato-pubescentibus; pedicellis gracilibus 2–4 cm. longis ex axillis foliorum superiorum mediorumque gestis sparse stellatis inconspicue glanduloso-pubescentibus; calyce ad anthesim ca.

8 mm. longo stellato, lobis lanceolatis; petalis albis dilute roseo-tinctis 1.5–1.8 cm. longis calyce duplo longioribus; tubo stamineo ad 4 mm. longo; filamentis biseriatis ca. 2 et 3 mm. longis; lobis styli ca. 8 mm. longis; carpellis sparsissime villosulis vel glabratis, alis oblique 4 mm. altis 3 mm. latis, seminibus ad 2 mm. altis ca. 1.3 mm. latis.—CHILE: gravelly floor of the quebrada, Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5270* (TYPE, Gray Herb.).

I associate with this species a prostrate perennial plant I collected on a rocky bushy slope above the fertile belt near Ag. Panulcito (*J. 5458*). It agrees with the type in the color and size of the corolla, but has ovate leaves with the margins merely sparsely and shallowly crenate and not lobed. I consider the plant to be only a leaf-variation. The species is most closely related to *C. Diaziana* from which it differs in its dense velutinous indument. With its relative it forms a small group which seems to be quite lacking in obvious relatives. The white petals, slightly flushed with pink and the spreading usually prostrate habit together readily distinguish the two species from all known congeners.

Cristaria Diaziana, sp. nov., perennis prostrata; caulibus gracilibus usque ad 8 dm. longis sparse breviterque ramosis sparsissime evanescenterque villosis pilis multicellularibus inconspicuis numerosis glanduliferis ornatis viridibus basem versus suffruticosis e radice valida erumpentibus, internodiis 2–10 cm. longis; foliis vix numerosis viridibus herbaceis pilis stellatis sparsis obtectis concoloribus apicem versus caulis gradatim reductis; lamina folii 1.5–3 cm. longa 1–2.3 cm. lata ambitu angulate ovata vel oblongo-ovata saepe subtrilobata sed saepissime elobata (rariter ultra medium evidenter trilobata, lobo mediali valde majori ambitu lanceolato vel ovato saepe trilobulato) margine sinuato-crenata basi truncata vel reniformi quam petiolo sparse villoso paullo longiori; pedicellis 1.5–3 cm. longis gracilibus sparse villosis glandulari-pubescentibus ex axillis foliorum superiorum erumpentibus; calyce ad anthesim ca. 6 mm. longo sparse villoso, lobis lanceolatis; petalis albis supra medium paullulo rubescentibus ca. 1.5 cm. longis calyce duplo longioribus; carpellis ca. 18, alis oblique ovatis 3 mm. longis 2 mm. latis; seminibus ad 1.5 mm. altis ca. 1 mm. latis.—CHILE: prostrate on a dryish rocky slope above the fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5365* (TYPE, Gray Herb.).

In the texture of its leaves and in the sparse pubescence this species much suggests *C. foliosa* Ph. but differs conspicuously in habit and inflorescence. It is most closely related to *C. leucantha* which has a similar prostrate habit and white rose-flushed petals. It differs from

C. leucantha, however, in its very sparse pubescence, the plant being green, hence, rather than somewhat tawny with a velvety indument. Most of the material of the new species has the leaves only obscurely if at all lobed. Two plants, however, have the leaves deeply trilobed.

Cristaria Fuentesiana, sp. nov., perennis prostrata; radice valida dense multicipitali; ramis gracilibus sparse breviterque ramosis paullo flexuosis usque ad 5 dm. longis paucifoliatis pilis minutis stellatis saepe adpressis vix abundantibus et saepe glandulis stipitatis inconspicuis sparsis ornatis, internodiis 3–10 cm. longis quam foliis vicinis saepe longioribus; foliis pallidulis pilis stellatis minutis numerosis adpressis vetustate subdeciduis obtectis subtus pallidioribus basem versus caulis aggregatis, basalibus subpersistentibus conspicuis 4–7 cm. longe petiolatis, lamina ambitu elliptica vel ovata 2–3.5 cm. longa 1.2–2.3 cm. lata sinuata vel grosse crenata vel trilobata basi truncata vel obtusa apice rotunda; foliis caulinis distantibus, apicem versus caulis reductis superioribus in bracteas minus quam 1 cm. longas gradatim transmutatis, medialibus saepe plus minusve simpliciter lobatis 2–3 cm. longis 0.5–3 cm. longe petiolatis lamina quam apud folia basalia saepe paullo latioribus; stipulis foliorum basalium lanceolatis 3–5 mm. longis 1–2 mm. latis acutis, foliorum medialium conspicuis 5–10 mm. longis 2–5 mm. altis recurvis; pedicellis gracilibus 1.5–5 cm. longis ex axillis foliorum superiorum valde reductorum erumpentibus; calycibus corolliferis ca. 8 mm. longis stellato-pubescentibus, lobis late oblanceolatis; petalis roseis ca. 18 mm. longis calyce aliquando fere duplo longioribus; carpellis glabris 25–30, alis 5 mm. longis 3 mm. latis ovatis; seminibus 1.5 mm. altis 1 mm. latis.—CHILE: prostrate on the foggy flats at the head of the sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5818;* prostrate on fog-bathed slopes near summit of Cerro de la Cachina, ca. 14 km. south of Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5686* (TYPE, Gray Herb.).

This variable, but very distinct species is characterized by its prostrate habit and the strong perennial root which produces a dense distinctly multicipital caudex. The stem-leaves are comparatively few and are gradually reduced up the stem so that the uppermost (those in the inflorescence) are very small and bract-like. The lowest leaves are very long-petioled and, springing from or just above the various heads of the caudex, suggest a rosulate arrangement. The blades on these leaves are very variable as to margin, some being coarsely crenate, others sinuate and some coarsely lobulate-dentate or even coarsely lobed. These irregularities as to margin are inconstant and vary in quantity from leaf to leaf. The stem-leaves are not only

short-petioled but differ from the lower leaves also in having the blades somewhat broader in proportion and usually more distinctly lobed. In the material cited above the leaf-lobes commonly extend only to about the middle of the blade. The blade, hence, may be definitely trilobed or by the deepening of the sinuses of the crenate margin somewhat pinnate-lobed. After considering the variability in the specimens cited I have no hesitation in referring to the species, as a variant phase, a collection from Cerro Cachina (*J. 6305*) which grew with the type and which differs in having the leaves all trilobed with the sinuses extending nearly to the midrib and those of the lobules more than half way to their midribs. After admitting this doubly lobed form there seems no alternative but to admit also a collection from the fertile belt on the foggy crests back of Barquito (*J. 4757*). This material has the characteristic caudex and habit of *C. Fuentesiana* but has a very sparse indument of stellate hairs and is accordingly greener than in the type. Most striking, however, are the leaves which are not only biternate but tend also to be triternately lobed or cleft. If the two aberrant collections just mentioned are admitted to the species, as I believe they should, then the plants referable to *C. Fuentesiana* are not only very variable as to leaf-outline on each plant but from plant to plant also.

In naming this remarkable species in honor of Prof. Francisco Fuentes, Curator of Phanerogams at the Museo Nacional in Santiago I am pleased again to acknowledge my gratitude to him for his kindly interest and help when I was working in the Philippi Herbarium now in his charge.

Cristaria concinna Ph. Fl. Atac. 11 and Viage Des. Atac. 25, 185 (1860).

The type of this species was collected near Paposo by Philippi. I obtained plants clearly referable to it in dry gravel at the mouth of the quebrada below Ag. Cardon (*J. 5266*). It is an erect perennial 6–12 dm. tall. The stems are loosely branched above and spring from a sparsely branched erect fruticose caudex 1–2 dm. tall. The petals are purplish-pink and ca. 14 mm. long. I refer to *C. concinna*, as a phase, a collection from rocky slopes and benches about the mouth of the quebrada below Ag. Miguel Diaz (*J. 5358*). This collection agrees in gross habit with the type and with my material from Ag. Cardon but has petals nearly 25 mm. long and 3–4-plo-pinnately dissected leaves.

Cristaria thinophila, sp. nov., perennis luteo-viridis; caulibus erectis 1–5 dm. altis sparse ascendenter ramosis villosis pilis stellatis substipitatis ascendenter ramosis abundantibus vestitis e caudice fruti-

coso decumbenti vel laxe ascendenti usque ad 5 mm. crasso laxe ramoso erumpentibus; foliis concoloribus breviter tomentosis pilis stellatis dense obtectis supra medium caulis abrupte reductis, lamina ambitu oblonga vel oblonga-ovata 3–4.5 cm. longa 2–3 cm. lata fere pinnatifida, lobis basalibus a lobo medio elongato profunde grosseque pinnato-lobato saepe divisis anguste flabellatis 1–1.5 cm. longis saepe grosse lobulatis; petiolo laminae aequilongo vel ea paullo longiori usque ad 6 cm. longo breviter villoso; stipulis 4–6 mm. longis subulato-cuneatis erectis; inflorescentia supra folia projecta bracteis minus quam 5 mm. longis ornata breviter villosa; pedicellis gracilibus 1–3 (–5) cm. longis in vivo subnutantibus; calyce ad anthesim ca. 8 mm. longo villoso, lobis lanceolatis; petalis purpurascentibus ca. 14 mm. longis calyce circa duplo longioribus; carpellis 17–20, alis ovatis 3–4 mm. longis 2.5–3 mm. latis oblique ovatis; seminibus ad 2 mm. altis ca. 1.2 mm. latis griseis.—CHILE: growing on slopes of dunes back of Punta de dos Reyes near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5359* (TYPE, Gray Herb.).

Although in its occurrence, gross habit and yellowish-green herbage this plant suggests *C. viridiluteola* Gay, it appears to be much more closely related to typical *C. concinna* Ph., having quite the same leaf-outline and kind and degree of leaf-lobing. It differs from *C. concinna* in its pubescence, smaller leaves, nodding flowers and different habit.

Cristaria viridiluteola Gay, Fl. Chile i. 322 (1845).

A small erect pink-flowered shrubby perennial, 1.5–5 dm. tall, growing on the dunes on the point of land just north of Chañaral (*J. 5845*) and near Caleta de Pan de Azucar (*J. 5842*). These plants agree closely with the much collected forms of the species from Caldera. Obviously related to this species and probably only a leaf variation is an erect plant, 3–9 dm. tall, which is abundant on the dunes on Punta del Médano (*J. 5246*). This latter plant has the characteristic habit of growth, the same close dense pubescence and the same inflorescence of small pink flowers, but the leaves have an irregular sinuate or coarsely lobed margin with the sinuses of the oblong lobes only rarely reaching more than half way to the midrib.

Cristaria foliosa Ph. Fl. Atac. 11 and Viage Des. Atac. 12, 185 (1860). *C. Borchersi* Ph. Anal. Univ. Chile lxxxii. 316 (1892). *C. setosa* Ph. Anal. Univ. Chile lxxxii. 317 (1892). *C. grandidentata* Ph. Anal. Univ. Chile lxxxii. 318 (1892).

A perennial, frequently very decidedly woody at the base, which forms a loosely branched bushy growth commonly 10–12 dm. tall. It grows below the fertile belt in sand or gravel and usually in rocky places. The leaves are thin and have a rather sparse oily villous in-

dument. The large corolla is pink or purplish pink but in drying becomes purple. The species has been collected at Las Animas (*Philippi*, type of *C. foliosa*), Taltal (*Ball; Borchers*, type of *C. setosa; Werdermann 777*), in Queb. San Ramon (*J. 5139*), Caleta de Oliva (*Borchers*, type of *C. Borchersi*), below Ag. Panul (*J. 5432*) and near Punta Plata (*J. 5245*). Ball, Jour. Linn. Soc. xxii. 156 (1886), reported the plant from Taltal as *C. Spinolae.*

Cristaria lobulata Ph. Fl. Atac. 11 and Viage Des. Atac. 12, 185 (1860).

Philippi collected the type of this species near Las Animas. It seems to be related to *C. foliosa.*

Cristaria integerrima Ph. Fl. Atac. 11 and Viage Des. Atac. 19, 185 (1860). *C. Larrañagae* Ph. Anal. Univ. Chile lxxxii. 320 (1892).

An annual or a very short-lived perennial usually with strict stems and branches. The leaves are entire or have only obscurely undulate margins. It has been collected on hillsides near Barquito (*J. 4756*), in Queb. Infieles south of Taltal (*J. 5644*), in hills southeast of Taltal (*J. 5091*), Taltal Valley (*Philippi*, type of *C. integerrima*), near Breas (*Larrañaga*, type of *C. Larrañagae*). The species is a frequent one in the region about Taltal. The corolla is pink and frequently very dilutely so.

I refer to this species with some doubt a collection from the Sierra Esmeralda north of Portezuelo de Mina Carola (*J. 5673*). The plants are loosely and ascendingly branched and have small (15–30 mm. long) leaves which are variable and tend to be coarsely toothed. The relation of this form with *C. integerrima* is clear as shown by the leaf-outline, texture, pubescence and flowers and it is possible that it may be of hybrid origin, although I am unable to suggest the other parent if it is so.

Cristaria paposana, sp. nov., perennis suffruticosa prostrata paullo fulvescens pilis mollibus stellatis abundanter vestita foliosa; ramis 1.5–2.5 dm. longis rigidiusculis laxe ramosis basem versus fruticosis et caudicem formantibus dense villosis, internodiis 1–3 cm. longis; foliis elliptico-ovatis vel late ovatis numerosis concoloribus velutinis 1.5–3 cm. longis 1–2.8 mm. latis margine integris vel saepe evidenter crenatis vel non rariter subtrilobatis (sinubus lobi usque ad 5 mm. profundis) basi rotundis vel subcordatis apice rotundis vel obtusis; petiolis 0.8–2(–4) cm. longis villosis laminis foliorum superiorum mediorumque saepe subaequilongis vel brevioribus; stipulis 2–3 mm. longis 0.5–1 mm. latis obcuneatis maturitate reflexis deciduis; pedicellis 1.5–2.5 cm. longis villosis ex axillis foliorum erumpentibus; calycibus ad anthesim 7–8 mm. longis, lobis lanceolatis

villosis; petalis dilute rosaceis 12–14 mm. longis calyce sesqui vel subduplo longioribus; tubo staminum ca. 4 mm. longo; filamentis biseriatis 2.5 et 3.5 mm. longis; carpellis ca. 14 glabratis, alis oblique ovatis 3.5–4 mm. altis 2.3–3 mm. latis; seminibus ca. 1.5 mm. altis ca. 1 mm. latis.—CHILE: west slope of Cerro Yumbes near Paposo in rocky ground in dryish shrubby area above the fertile belt, Dept. Taltal, Dec. 8, 1925, *Johnston 5549;* dryish gravelly ridge just above fertile belt, El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5502* (TYPE, Gray Herb.).

Apparently most closely related to *C. integerrima* Ph. from which it differs conspicuously in its prostrate habit, perennial root, abundant soft velvety pubescence and irregular leaf-margins.

Cristaria intonsa, sp. nov., annua erecta stricte ramosa 3–9 dm. alta pilis stellatis ascendente longeque ramosis rigidiusculis vestita viridis; caulibus solitariis vel pluribus breviter stricteque ramosis hispido-villosis; foliis tenuiter herbaceis hispido-villosis concoloribus medium versus caulis maximis utroque diminuentibus; lamina foliorum inferiorum elliptica vel ovato-elliptica subintegra vel paullo crenata 1.5–2.5 cm. longa 9–14 mm. lata petiolo villoso aequilonga vel eo paullo longiori; lamina foliorum mediorum latissime ovata vel ovato-deltoidea 4–4.5 cm. longa ca. 4 mm. lata plus minusve trilobata margine sinuata basi truncata vel reniformi petiolo villoso subaequilonga vel paullo longiori; stipulis subulatis 3–6 mm. longis 0.5–1 mm. latis; pedicellis gracilibus villosis 1–3 cm. longis ex axillis foliorum superiorum reductorum erumpentibus; calyce ad anthesim 6–7 mm. longo villoso; petalis dilute roseis ad 12 mm. longis calyce duplo longioribus; carpellis 17–22 glabris, alis 4–5 mm. longis oblique ovatis; seminibus ad 2 mm. altis ca. 1.3 mm. latis.—CHILE: in a dry silty stream-way on the coastal plain below Aguada del Cardon, Dept. Taltal, Dec. 4, 1925, *Johnston 5267* (TYPE, Gray Herb.).

This plant seems to be most closely related to *C. integerrima* which it resembles in habit of growth and flowers. It differs however, in its somewhat lobed leaves and abundant stiffish villous indument. The herbage in texture is intermediate between that of *C. foliosa* and *C. integerrima.* The plant may possibly be a hybrid of those species.

Cristaria formosula, sp. nov., annua gracilis; caulibus erectis vel laxe ascendentibus 1.5–5 dm. longis paullo flexuosis saepe breviter laxeque ramosis stipitato-glanduliferis glabratis vel sparse stellato-pubescentibus, internodiis 2–8 cm. longis; foliis dissectis saepe 3–5-foliolatis ad apicem versus caulis gradatim reductis pilis sparsis stellatis obtectis subtus subpallidioribus non rariter plus minusve

glanduliferis, foliolis in lobulis remotis saepe dentatis pinnato-dissectis; foliis inferioribus ambitu late ovatis vel triangulari-ovatis basi saepe cordatis vel reniformibus 3–7 cm. longis 3–6 cm. latis, petiolis laminae aequilongis vel ea paullo longioribus; foliis superioribus anguste triangulari-ovatis breviter petiolatis basi truncatis vel leviter reniformibus saepe trifoliolatis; stipulis lanceolatis integris 1–5 mm. longis 1–2 mm. latis; pedicellis 1–3 cm. longis gracilibus glanduliferis non rariter pilis stellatis sparsis vestitis ex axillis bractearum 5–20 mm. longarum pinnatifidarum inconspicuarum erumpentibus in racemos elongatos dispositis; calcyce ad anthesim ca. 6 mm. longo pilis stellatis dense vestito, lobis late lanceolatis; petalis roseis 12–17 mm. longis calyce duplo- vel triplo-longioribus; carpellis 20–25 glabratis, alis oblique ovatis 1.5–2 cm. longis; seminibus ca. 1.2 mm. altis ca. 0.8 mm. latis.—CHILE: on dunes and gravel stream-ways on point just south of Caleta de Pan de Azucar, Dept. Chañaral, Dec. 18, 1925, *Johnston 5841;* gravelly floor of quebrada below Aguada Grande, Dept. Chañaral, Dec. 18, 1925, *Johnston 5819* (TYPE, Gray Herb.); head of sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5820;* dry gravelly stream-ways near Aguada de la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5685;* hills near Antofagasta, Oct. 19, 1925, *Johnston 3629.*

This species is readily distinguished from all other species in our area by its loosely branched habit, annual root, and dissected foliage. The leaves are usually divided into 3–5 elongate pinnately lobed leaflets. A collection from near Ag. Cachina (*J. 6306*) is quite like *C. formosula* except that the leaves are only obscurely lobed or are lobed with the lobes broadly joined below. I believe this to be merely a leaf-variation.

Cristaria diversifolia Ph. Anal. Univ. Chile xxxvi. 165 (1870). *C. heterophylla* Ph. Fl. Atac. 11 and Viage Des. Atac. 19, 185 (1860), not H. & A. (1833). *C. parvula* Ph. Anal. Univ. Chile lxxxii. 317 (1892). *C. trifida* Ph. Anal. Univ. Chile lxxxii. 321 (1892).

Frequent in dryish gravelly soils on hillsides and in quebradas, usually outside the fertile belt. Although extremely variable it is it is readily recognized since it is the only annual in our area with purple or decidedly purplish corollas. It is further marked by its very sparse pubescence and subentire or trilobed leaves. The species is highly variable in the size and proportions of the corolla and in the shape of the sepals, even within a restricted area and particularly in the region about Taltal. The type of *C. diversifolia*, from Hueso Parado, has petals 15 mm. long and about three times the length of the calyx. A collection from near Taltal made by Werdermann (no.

766) has petals over 20 mm. long and something over three times as long as the calyx. Connecting with these large-flowered forms by intergrades is a small-flowered form which has petals (2–5 mm. long) scarcely if at all surpassing the calyx. Representing this small-flowered plant are the types of *C. parvula* Ph. (from "provincia Copiapó") and *C. trifida* Ph. (from "Caldera"). This small-flowered plant I am treating as **C. diversifolia** forma **parvula** (Ph.), comb. nov. It seems to be the most common form of the species in the southern part of the range of the latter although it is by no means restricted there. In fact at the most northern known station of the species, i. e. Antofagasta, it is represented by the small-flowered phase. I have examined the following collections from our area. The numbers accompanied by an asterisk represent the forma *parvula*. Barquito (*J. 4755**), hills southeast of Taltal (*J. 5089, 5090**, *6299*), Taltal, alt. 50 m., (*Werdermann 790**), Taltal, alt. 200 m., (*Werdermann 766*), Hueso Parado (*Philippi*, type of *C. heterophylla*), between Queb. San Ramon and Paso Malo (*J. 5178**), back of Punta Grande (*J. 5214*), Cerro Yumbes near Paposo (*J. 5548*), between Paposo and Punta Rincon (*J. 5566*).

I doubtfully associate with this species some collections made in Queb. Infieles south of Taltal. One collection (*J. 5643*) seems referable to *C. diversifolia* although the stems do seem somewhat coarser and stiffer than is typical. Another collection (*J. 5642*), has the same coarse stiffish stems, but has the leaves varying in outline from ovate, with crenate or dentate margins, to tripartite. The texture of the leaves is thickish and the pubescence is grayish and suggestive of that of *C. integerrima*. The corollas is purplish pink. I suspect that the collection is of hybrid origin.

Cristaria

I have been unable to place satisfactory a collection made on a dry gravelly outwash plain between Paposo and Punta Rincon (*J. 5567*). The plant is a perennial herb ca. 1 m. tall with numerous ascending branches. The petals are pink. No basal leaves were found. The stem-leaves are usually 3-lobed.

Cristaria ovallea Gay, Fl. Chile i. 330 (1845); Ph. Fl. Atac. 11 and Viage Des. Atac. 12, 185 (1860).

Reported from Las Animas by Philippi. I have not seen Philippi's specimens and I doubt the correctness of his determination.

GUTTIFERAE

Hypericum paposanum, nom. nov. *H. dichotomum* Ph. Fl. Atac. 12 and Viage Des. Atac. 25, 27, 186 (1860), not Lam. (1797).

A plant growing on grassy slopes in the fertile belt. It is known only from our area and has been collected only at Paposo (*Philippi*, type), El Rincon (*J. 5520*), and Ag. Miguel Diaz (*J. 5396*). Philippi reports the species from Miguel Diaz but I could not find in his herbarium any specimens from that locality.

FRANKENIACEAE

Frankenia chilensis Presl, var. **aspera** (Ph.), comb. nov. *F. aspera* Ph. Fl. Atac. 10 and Viage Des. Atac. 24, 25, 184 (1860). *F. Nicoletiana*, var. *aspera* Reiche, Anal. Univ. Chile xcii. 922 (1895) and Fl. Chile i. 172 (1896). *F. campestris* Schauer, Nov. Act. Acad. Caes. Leop.-Car. Nat. Cur. xix. suppl. 1, 480 (1843). *F. Nicoletiana* Gay, Fl. Chile i. 248 (1845). *F. farinosa* Remy, Ann. Sci. Nat., Bot. ser. 3, viii. 236 (1847).

Forming low spreading shrubby growths on dry plains near the sea or on adjacent hillsides. The flowers are pink or pinkish. It has been collected in our area at Barquito (*J. 4786*), near Taltal (*Werdermann 782*) and near Paposo (*J. 5574*). I have not seen the type of *F. aspera* which came from Paposo nor, for that matter, any of the material of this genus in the Philippi Herbarium. The whole representation of the genus in that herbarium appears to be lost. I doubtfully refer to the var. *aspera* the material I collected at the summit of the sea-cliffs near Ag. Grande (*J. 5783*). This material has corollas 1.5–1.8 mm. long, united styles and numerous sparsely branched stems (1–1.5 dm. long) springing from a very strong perennial root. Material from a dry stream-way near Ag. Cachina (*J. 5714*) is also atypical, these plants being erect with strict branches. It will be noticed that I have referred to the var. *aspera* the common *Frankenia* of Atacama and Antofagasta. The glabrous or nearly glabrous plant of Coquimbo I consider to be typical *F. chilensis* Presl. In all these Chilean forms the lobing or lack of lobing of the style seems to be variable. I seriously doubt that trustworthy specific characters can be found in the style.

VIOLACEAE

Viola polypoda Turcz. Bull. Soc. Nat. Moscou xxxvi. pt. 1, 555 (1863). *V. asterias*, var. *glaberrima* Ph. Fl. Atac. 9 and Viage 183 (1860). *V. psammophila* Ph. Linnaea xxxiii. 14 (1864). *V. pseudasterias*, var. *psammophila* Reiche, Bot. Jahrb. xvi. 435 (1893). *V. asterias*, var. *caulescens* Ph. Anal. Univ. Chile lxxxi. 491 (1892). *V. asterias*, var. *atacamensis* Ph. Anal. Univ. Chile lxxxi. 492 (1892). *V.*

asterias, var. *depauperata* Ph. Anal. Univ. Chile lxxxi. 492 (1892). *V. pseudasterias* Reiche, l. c. 435. *V. calderensis* Becker, Bot. Jahrb. xxxvii. 588 (1906). *V. Werdermannii* Becker, in Fedde, Repert. xxiii. 222 (1926). *V. Werdermannii*, f. *glandulifera* Becker in Fedde, Repert. xxiii. 223 (1926). *V. Werdermannii*, f. *glaberrima* Becker in Fedde, Repert. xxiii. 223 (1926).

A small annual, frequently somewhat succulent, herb with yellow flowers. It grows mostly below the fertile belt in dryish gravelly or sandy places as on dunes, dry stream-ways, benches or not infrequently even on hillsides. In our area it has been collected near Barquito (*J. 4775*), Taltal (*Werdermann 787*, isotype of *V. Werdermannii; J. 5072*), Breas (*San Roman*, type of var. *atacamensis*), Paso Malo (*J. 5168*), Ag. Cardon (*J. 5276*) and Ag. Miguel Diaz (*J. 5391*). With the exception of San Roman's collection from Breas all the material cited has been determined by Dr. W. Becker as *V. Werdermannii*. My nos. *5168* and *5391* were determined as the var. *glandulifera*. I am unable to discover how these plants of the province of Antofagasta are to be separated from those of Atacama. The type of *V. polypoda* Turcz. is *Bridges 1386* from the coastal hills near Huasco! The type of *V. pseudasterias* Reiche, also came from Huasco and seems to be quite the same as *V. polypoda*. *Viola psammophila* Ph. and *V. calderensis* Becker, both from Caldera, are conspecific and seem to represent merely a dwarf dune phase that has been repeatedly collected about Caldera. Reiche has made much of the shape of the style-crests. Most of the plants from Atacama and Antofagasta have the crests rounded or practically entire-margined. True *V. asterias* H. & A. has the crest cut into three elongate lobes. This plant I have not seen north of Coquimbo. Some forms which I place without much question into *V. polypoda* have the crests shallowly but distinctly three-lobed. My collection no. *5072* from near Taltal, which was determined as *V. Werdermannii* by Becker, has some of the plants producing entire stigma-crests and others weakly lobed ones, although in other respects they seem similiar. It might be noted here that *V. asterias* H. & A., Bot. Miscl. iii. 145, t. 99 (1833), has an earlier synonym in, and should be replaced by, *V. pusilla* Poepp., Froriep, Notizen xxiii. 277 (1829), a species based upon Poeppig's collection from Concon, Chile.

Viola taltalensis Becker in Fedde, Repert. xxiii. 223 (1926).

This is a plant with the yellowish green herbage and the gross habit of *V. polypoda* but with violet rather than yellow flowers. Referred here by Becker is my material from an elevated beach at Caleta de Hueso Parado (*J. 5164*) and from the dry gravelly coastal plain

between Paposo and Punta Grande (*J. 5571*). The former collection is densely villous, but the latter is quite glabrous and accordingly belongs to Becker's var. *glaberrima*. The types of both species and variety were obtained by Werdermann (no. *794*) in coarse gravel at ca. 200 m. alt. near Taltal. It is not impossible that *V. taltalensis* may represent only a hybrid of *V. polypoda* and *V. litoralis*.

Viola litoralis Ph. Fl. Atac. 9 and Viage Des. Atac. 19, 183 (1860).

Common at Caleta de Hueso Parado (*J. 5129*) just south of the mouth of Queb. San Ramon where it grew in dry gravel on an elevated beach just back from the shore. This locality is probably the exact type locality. Werdermann (no. *818*), cf. Becker, Fedde, Repert. xxiii. 224 (1926), collected it near Taltal in dry stream-ways at ca. 50 m. alt. The plant is brownish green and has decidedly violet petals.

Viola Johnstonii Becker in Fedde, Repert. xxiv. 110 (1927).

Growing in decomposed rock in excessively dry, nearly barren situations above the fertile belt on the crests above Ag. Panulcito (*J. 5464*, type) and on the slopes just east of the crest of Cerro Yumbes (*J. 5554*). The corolla is violet. The two collections are very similar in details. They may, however, represent no more than a broad-leaved phase of *V. litoralis*. The plants are unquestionably annual and not perennial as indicated by Becker.

MALESHERBIACEAE

Malesherbia humilis Poepp. in Froriep, Notizen xxiii. 291 (1829). *M. humilis* Don, Edinb. New Philos. Jour. xii. 111 (1831); Ph. Fl. Atac. 18 and Viage Des. Atac. 17, 192 (1860).

A small annual which is frequent in dryish gravelly soil. Philippi reports it from Las Animas, Cachinal de la Costa, Llano Colorado and Hueso Parado. I have seen material from Barquito (*J. 4759*), Sierra Esmeralda (*San Roman*), Taltal (*Werdermann 778; J. 5095, 5096*) and Puerto Oliva (*Advena*). The flowers are usually pale blue. About Taltal, however, a white form is quite common. Poeppig and Don independently and without reference to each other applied the name *M. humilis* to the present species. Poeppig based his name upon material he himself collected in the upper part of the valley of the Rio Aconcagua. Don's name is founded upon collections of Macrae and of Cuming from Coquimbo.

LOASACEAE

Mentzelia chilensis Gay, var. **atacamensis** Urb. & Gilg, Monog. Loasac. 50 (1900). *M. chilensis* of Ph. Fl. Atac. 19 and Viage Des. Atac. 18, 19, 193 (1860).

This plant is frequent in Queb. Taltal where it grows on the gravelly floor of the quebrada and on the adjacent hillsides. It is a prostrate or loosely decumbent annual herb with flowers 2.5–3 cm. broad. The variety, which is a weak one, is known only from near Taltal (*Philippi, Werdermann 798, J. 5092*) and to the eastward near Breas (*Larrañaga*).

The typical form of the species is known only from northern parts of the province of Coquimbo.

Loasa Bertrandi Ph. Anal. Univ. Chile lxxxv. 11 (1893). *L. Arnottiana* of Ph. Fl. Atac. 19 and Viage Des. Atac. 15, 25, 193 (1860).

A common herbaceous annual twining through bushes or forming tangled prostrate nets on hillsides or on the gravelly floors of quebradas near the coast. The opposite leaves are shiny green above and dull beneath. The petals are white but the squamae are yellow below and bright red above the middle. The plant is common and conspicuous but because of its sharply stinging hairs was collected only near Barquito (*J. 4758*) and Taltal (*J. 5094*). I have also seen material from Taltal (*Werdermann 786*), "Cachinal and Paposo" (*Philippi*), Breas (*Larrañaga*) and Desert of Atacama (*San Roman*, type). With the original description the source of the type is given as "In deserto Atacama loco dicto "Brea" legit orn. San Roman." The cover marked "*Loasa Bertrandi*" in the Philippi Herbarium contains two collections, one a mere snip from Breas collected by Larrañaga and second a good specimen collected by San Roman in 1883 in "Desert. Atacama." It is obvious, therefore, that the geographical data given with the original description is confused. Urban & Gilg, Monog. 359 (1900), refer *L. Bertrandi* to *L. elongata* H. & A., a species based upon material from Coquimbo. I have seen no material from south of Barquito that I should care to associate with the present plant. As the name *L. Bertrandi* is clearly applicable to it I prefer to use that name.

Loasa tricolor Ker, Bot. Reg viii. t. 667 (1822).

The common plant I refer here is either a variety of this polymorphous species or a closely related undescribed species. It is an annual, non-twining herb which forms prostrate growths on gravelly soil or on hillsides. Its petals are orange-yellow and the squamae are flesh-colored above and red below the middle. The foliage is provided with stinging hairs. It has been collected only at Taltal (*Werdermann 842; J. 5093*) and at Ag. Panul (*J. 5433*) but is frequent in our area and extends north to Antofagasta and Tocopilla. It is probably the plant reported as no. 113 by Philippi, Fl. Atac. 19 and Viage Des. Atac. 193 (1860).

Loasa sessiliflora Ph. Anal. Univ. Chile lxxxv. 12 (1893).

Locally very common on the dry gravelly bed of the quebrada in the Sierra Esmeralda ca. 1.5 km. north of Portezuelo de Mina Carola (*J. 5674*). It is a perennial with a rather brittle juicy root and numerous loosely tufted stems 3–6 dm. long. The stems are usually subdecumbent or ascending and are covered with stinging hairs. The corolla is white. The type of this remarkably distinct species was collected at "Esmeralda" by San Roman. It is otherwise known only from a collection recently made at Antofagasta by Pennell. The relations of *L. sessiliflora* are wholly uncertain. Its leaves being all alternate and its capsules producing only 3–6 seeds the plant falls in the series *Floribundae* as defined by Urban & Gilg. The plant, however, does not have any obvious relatives there and its squamae, which are as described by Urban & Gilg, l. c. 361, do not accord with those of the other species of that series, nor with those of the series *Malesherbioideae*, the group which our plant in habit most suggests.

Loasa fruticosa (Ph.) Urb. & Gilg, Monog. Loasa. 256 (1900). *Huidobria fruticosa* Ph. Anal. Univ. Chile xii. 219 (1855); Fl. Atac. 19 and Viage Des. Atac. 24, 25, 50, 193 (1860).

I saw this remarkable plant only in Queb. Guanillo near Paposo (*J. 5588*) at the same locality at which Philippi, in Dec. 1853, first observed and collected it. It is a pronounced xerophyte growing on the dry floor or the quebrada or occasionally in adjacent hillside gullies above Aguada Pique. Even about Aguada Pique it is very dry and the vegetation very sparse but despite the rapidly increasing aridity the plant extends about a kilometer further inland to near Mina Chimba where it finally disappears and the absolute desert begins. It is usually a widely branched depressed shrub ca. 3 dm. tall and 9–15 dm. broad, but more rarely an erect-branched bush 6–9 dm. tall and 3–5 dm. broad. The flowers are white. The leaves are thick and canescent.

Loasa chilensis (Gay) Urb. Bericht. Deutsch. Bot. Ges. x. 222 (1892); Monog. 258 (1900). *Huidobria chilensis* Gay, Fl. Chile ii. 440, t. 26 (1846); Ph. Fl. Atac. 19 and Viage Des. Atac. 21, 193 (1860).

A slender loosely branched brittle bush 6–12 or even 18 dm. tall growing in gravelly places. It has been collected in our area in Queb. Cachina above Ag. Cachina (*J. 5687*) and at Carrizalillo further inland (*Harding*). I also collected it at the north end of Caleta de Hueso Parado at the mouth of Queb. San Ramon (*J. 5140*) which is probably the station reported by Philippi as being near Mal Paso. The flowers are white.

CACTACEAE

Opuntia spp.

On the dry slopes above the fertile belt at El Rincon, Ag. Panulcito and Ag. Miguel Diaz, and as I recollect, also on the dry landward slopes back of the sea cliffs near Ag. Grande and Ag. Cachina, I observed a cylindropuntia which grew 5–10 dm. tall and was covered with extremely numerous straw-colored spines 2–3 cm. long. The joints became detached very readily. My animals were continually annoyed by them. No flowers of this plant were observed. The plant may possibly be *Opuntua tunicata* Link & Otto, which has been reported from near Taltal by Söhrens, Monatsschr. Kakteenk. x. 6 (1900) and is very probably the *Opuntia* sp. from Hueso Parado mentioned by Philippi, Fl. Atac. 24 and Viage Des. Atac. 198 (1860).

Philippi, Fl. Atac. 24 and Viage Des. Atac. 16, 198 (1860) also mentions a species of this genus observed on the plains northeast of Cachinal de la Costa. This was said to have yellowish spines and red flowers.

Another *Opuntia*, under the name of *O. sulphurea* Don, is reported from about Las Animas and Chañaral by Philippi, Viage Des. Atac. 13, 14 (1860). The determination however, is probably incorrect.

Cereus coquimbanus (Molina) K. Schum. Kakteen 58 (1897). *C. nigripilis* Ph. Fl. Atac. 23 and Viage Des. Atac. 15, 25, 197 (1860).

Forming loose clumps 1–2.5 m. tall in the fertile belt throughout our area. Collections were made on the sea-cliffs near Ag. Cachina (*J. 5703*) and in the hills near Taltal (*J. 5077*) which were determined by Dr. Werdermann. Philippi reported it from Paposo and I observed it as common as far north as the slopes about Ag. Miguel Diaz.

Philippi, l. c., also reports "*C. peruvianus* DC." as accompanying his *C. nigripilis*. Just what plant he referred to is uncertain for the determination is certainly incorrect. Perhaps the name was given to some phase of *C. coquimbanus*.

Cereus spinibarbis Otto in Pfeiffer, Enum. Cact. 86 (1837). *Eulychnia breviflora* Ph. Fl. Atac. 24, t. 2a and Viage Des. Atac. 18, 25, 198 (1860).

Referred here are collections from the hills near Taltal (*J. 5076*) and from the rocky coastal plain on Punta Grande (*J. 5572*). The common large *Cereus* so characteristic of the fertile belt from Taltal to Miguel Diaz is presumably referable to this species. My two collections were determined by Dr. Werdermann. The outer surface of the calyx and fruit is underlaid with a tissue formed of vesicles, 1–2 mm. in diameter, filled with a pale mucilaginous liquid. The petals are white. The calyx and fruit are covered with brown or sooty trichomes.

Cereus iquiquensis K. Schum. Monatsschr. Kakteenk. xiv. 99 (1904).

Dr. Werdermann has determined as this species material collected on the sea-cliffs near Ag. Cachina (*J. 5702*). While obviously a close relative of *C. spinibarbis*, as observed about Taltal and Paposo, the plant differs conspicuously in having larger more globose flowers which are covered with a more abundant loose white or somewhat brownish wool. The areoles on the stems are also much more conspicuously hairy, being villous rather than simply velutinous.

Echinocactus cinereus Ph. Fl. Atac. 23 and Viage Des. Atac. 18, 25, 197 (1860).

I collected this species only on the hills southeast of Taltal (*J. 5074*). Probably conspecific, since it agrees closely with the Taltal plant in habit, is the large glaucous *Echinocactus* which grows frequently in great abundance on the coastal plain of our area and also somewhat less abundantly on the arid slopes above the fertile belt on the coastal hills. Philippi reports it only from Taltal, Paposo and El Cobre. Schumann, Monatsschr. Kakteenk. xi. 5 (1901), also reports it from Taltal. This species and the next five enumerated are referable to the segregate genus *Copiapoa*, Britt. & Rose, Cact. iii. 85–90 (1922).

Echinocactus marginatus Salm-Dyck, Allg. Gartenz. xiii. 386 (1845).

Dr. Werdermann has determined as this species a collection from the western end of the Llano Colorado (*J. 5655*). The stems numbered 25–100 or more and formed a dense subglobose or semispherical masses 5–10 dm. tall on a dry rocky slope. The flowers were rose-colored and the fruit red.

Echinocactus Pepinianus Lem. ex K. Schum. Kakteen 420 (1898).

Doubtfully determined as this species by Dr. Werdefmann is a collection from Ag. Cachina (*J. 5701*).

Echinocactus columnaris Pfeiff. Abbild. u. Beschr. ii. sub t. 14 (1847); Ph. Fl. Atac. 23 and Viage Des. Atac. 15, 18, 25, 197 (1860).

Reported by Philippi from Cachinal de la Costa, Taltal Valley, and Paposo.

Echinocactus copiapensis Pfeiff. Abbild. u. Beschr. ii. sub t. 14 (1847); Ph. Fl. Atac. 23 and Viage Des. Atac. 18, 25, 197 (1860).

Reported from Taltal Valley and near Paposo by Phillippi.

Echinocactus humilis Ph. Fl. Atac. 23 and Viage Des. Atac. 25, 197 (1860).

Based upon material collected on the coastal plain near Paposo by Philippi. Britton & Rose, Cact. iii. 89 (1922), were unable to place this species.

Echinocactus occultus Ph. Fl. Atac. 23 and Viage Des. Atac. 15, 25, 197 (1860).

Philippi reports this species as occurring from Copiapó to El Cobre and mentions specific occurrence at Cachinal de la Costa and Paposo. I collected the plant only on a dry gravelly terrace in Queb. Taltal a few kilometers east of Taltal (*J. 5073*). Schumann, Monatssch. Kakteenk. xi. 92 (1901), reports the plant from Breas. This species and the next are referable to the segregate genus *Neoporteria* Britt. & Rose, Cact. iii. 94–100 (1922).

Echinocactus Jussieui Monv. ex Salm-Dyck, Cact. Hort. Dyck. 170 (1850).

A plant collected on the dry shrubby slopes above the fertile belt near the crest of Cerro Yumbes near Paposo (*J. 5553*) has been determined as this species by Dr. Werdermann.

Echinocactus napinus Ph. Anal. Univ. Chile xli. 720 (1872).

Reported from Breas by Schumann, Kakteen, Nachtr. 109 (1903), and from the same general region by Reiche, Bot. Jahrb. xlv. 347, fig. 2 (1911). This species and the following ones are referable to the segregate genus *Malacocarpus* Salm-Dyck. cf. Brit. & Rose, Cact. iii. 187–207 (1922).

Echinocactus Froehlichianus K. Schum. Kakteen, Nachtr. 124 (1903).

Specimens collected between Cascabeles and Ag. Dulce (*J. 5169*) has been determined as this species by Dr. Werdermann. The plant grew on low cliff on the coastal plain.

Echinocactus sp. nov., Werd. in lit.

Plants found on a rocky slope in the Sierra Esmeralda just south of Pique de Jacinto Diaz (*J. 5676*) have been indicated by Dr. Werdermann as representing an undescribed species.

Echinocactus mammillarioides Hook. Bot. Mag. lxiv. t. 3558 (1837); Ph. Fl. Atac. 23 and Viage Des. Atac. 18, 197 (1860).

Philippi reports this species from Taltal Valley.

LYTHRACEAE

Lythrum Hyssopifolia L. Sp. Pl. 447 (1753).

Locally abundant in wet sand in the quebrada just below Ag. Grande (*J. 5816*). The plants grew 10–15 cm. tall and were unbranched.

Pleurophora pungens Don, Edinb. New Philos. Jour. xii. 112 (1831).

A brittle slender-stemmed decumbent or prostrate undershrub

which was observed only twice, once on the gravelly floor of the quebrada near Ag. Grande (*J. 5817*) and again on a gravelly bench just back from the shore on Punta Grande near Paposo (*J. 5216*). Both of these collections have a greenish yellow hypanthium and pinkish petals and filaments. These colors are conspicuously paler than in the plants I saw in the cordilleras of Atacama.

ONAGRACEAE

Oenothera coquimbensis Gay, Fl. Chile ii. 331 (1846).

I refer here material collected in a dry sandy stream-way at Barquito (*J. 4772*) and on the dunes just south of Caleta de Pan de Azucar (*J. 5839*). Similar plants were also collected on dunes near Caldera (*J. 5065*). The plants of these three collections are erect annuals usually less than 3 dm. tall, and are clothed with a fine appressed inconspicuous pubescence. Except for the fine pubescence, they agree well with the original description and with an isotype of the species from the dunes near La Serena. The plants have small flowers, the mature buds being only 3–5 mm. long. These buds do not open and as they are frequently found surmounting ripening capsules they probably are cleistogamic flowers. Whether all the flowers on the plants are cleistogamic or whether only those are which are produced late in the season, I cannot say. I suspect, however, that the early flowers are chasmogamic and that *Oe. grandidentata* Ph., Linnaea xxxiii. 68 (1864), the type of which came from Caldera, represents the vernal phase of the species. The type of *Oe. grandidentata* has no open flowers, only a bud ca. 1 cm. long which appears to have been swelling when the plant was collected. This plant is clearly the same as those frequently collected about Caldera which produce corollas with petals 1–2 cm. long.

Reiche, Fl. Chile ii. 258 (1898), has applied the name *Oe. coquimbensis* to the much collected plant of the dry interior (Caldera and Copiapó south to Bandurrias and Valle Carrizal) which has corollas ca. 35 mm. broad and usually has a conspicuously long-villous calyx. Gay, however, correctly described the type as being glabrous or obscurely villous on the younger parts and as having the corollas scarcely 6 mm. in diameter. It is obvious, therefore, that Reiche is incorrect and that the plants he treats as typical *Oe. coquimbensis* are in fact better placed in *Oe. grandidentata*. Reiche in addition treated *Oe. grandidentata* Ph. as a variety of *Oe. coquimbensis* and incorrectly placed under it the small-flowered coastal forms most of which are typical *Oe. coquimbensis*. He has, hence, confused both concepts.

UMBELLIFERAE

Bowlesia integerrima Turcz. Bull. Soc. Imp. Nat. Moscou xx. pt. 1, 170 (1847).

A very loosely branched prostrate canescent annual herb growing in dryish gravelly places. It has been collected in our area on a rocky hillside at the head of Queb. de Infieles south of Taltal (*J. 5647*), at 100 m. alt. near Taltal (*Werdermann 791*), on a rocky sea-ward terrace just above Agua Dulce (*J. 5191*) and on a gravelly bench on the coastal plain between Paposo and Punta Grande (*J. 5568*). The species ranges south at least to the Vallenar Valley and is very readily separable from *B. dichotoma* DC. by having very slender loosely spreading or prostrate stems, usually entire leaves, and in having the smaller fruit covered with trichomes similar to the peltate disk-like ones characteristic of many species of *Croton*. The stems and leaves have an ordinary stellate pubescence. In *B. dichotoma* the pubescence on the fruit is like that on the herbage. The type of *B. integerrima* came from the hills between Huasco and Copiapó and not from Coquimbo as originally given!

Bowlesia incana R. & P. Fl. Peruv. iii. 28, t. 268a (1802). *B. tenera* Spreng. Syst. i. 880 (1825); Urb. in Mart. Fl. Bras. xi. pt. 1, 292 (1879).

Collected by Werdermann (no. *867*) at ca. 400 m. alt. near Taltal.

Bowlesia paposana, sp. nov., debilis annua; caulibus 1–5 dm. longis 1 mm. crassis procumbentibus saepe solitariis plerumque dichotome ramosis ubique cum pilis stellatis rigidis sparsis asperatis e radice tenue filiformi orientibus internodiis 3–12 cm. longis; foliis viridibus sparse graciliter stellatis 5-costatis, basibus petiolorum dilatatis in vaginam angustam membranaceam margine fimbriatam saepe connatis; foliis mediis et superioribus oppositis, lamina petiolo subaequilonga vel non rariter duplo breviori 1–2 mm. longa et paullo latiori ad medium evidenter trilobata vel non rariter subquinquilobata basi cordata vel reniformi, lobis saepe triangularibus acutis mucronulatis, lateralibus saepe conspicue dentatis vel bilobulatis, lobo medio ceteris saepe paullo longiori integro vel saepe conspicue 1–2-dentato sinubus rectangularibus; foliis inferioribus alternis lobis obtusis vel rotundis brevioribus; umbellis ad nodos 2 vel rariter 3 sessilibus vel graciliter (usque ad 2 cm. longe) pedunculatis 1–3-floris; floribus subsessilibus; sepalis nullis; petalis ovatis 0.3–0.5 mm. longis albis medium versus longitudinaliter flavo-lineatis glaberrimis apice obtusis vel rotundis rectis; filamentis compresse subulatis quam antheris subglobosis duplo longioribus glabris ca. 0.15 mm. longis; fructibus 2–2.5

mm. longis sessilibus; mericarpiis ovatis stellatis et cum appendiculis linearibus summum ad apicem stellato-glochidiatis munitis, basi rotundis, dorso cancavis et saepe per margines laterales inflexos plus minusve obscuris, facie convexis. CHILE: under large cacti on the west slope of Cerro Yumbes just east of Paposo, Dept. Taltal, Dec. 8, 1925, *Johnston 5550* (TYPE, Gray Herb.).

Of this interesting plant only one large colony was seen. On a moist slope in the fertile belt on the south slope of Cerro Yumbes along the trail to Ag. Perales I found an abundance of the plant trailing over the ground in the shelter of a large group of cactus. Among the Chilean species it is most nearly related to *B. uncinata* Colla (= *B. tripartita* Clos), but differs in having stems much less conspicuously scabrous, and in having smaller fruit with the mericarps dorsally inflexed and smaller flowers lacking sepals. *Bowlesia paposana*, however, is most closely related to the Bolivian and Peruvian species. *Bowlesia Mandoni* Rusby (*Mandon 578* from Sorata) and *B. lobata*, var. *humifusa* Ball (Ball's collection from Chicla) resemble our plant but the leaves of these forms (similar to those of *B. incana* R. & P.) are smaller and have shorter rounded rather than acute lobes. They have small sepals and mericarps which are not dorsally inflexed and are angled rather than rounded on the face. The mericarps, however, bear glochids similar in form to those of *B. paposana*.

Asteriscium Vidali Ph. Anal. Univ. Chile lxxxv. 711 (1894).

I refer here the sprawling or decumbent plants I found on a dryish ridge-crest above the fertile belt above El Rincon (*J. 5506*), in gravelly open places in the fertile belt near Ag. Panulcito (*J. 5459*) and on the dryish rocky floor of the quebrada near Ag. Miguel Diaz (*J. 5374*).

Gymnophyton foliosum Ph. Fl. Atac. 24 and Viage Des. Atac. 19, 198 (1860). *Dipterygia foliosa* Kuntze, Rev. Gen. ii. 267 (1891). *G. foliatum* Ph. Viage Des. Atac. 18 (1860).

This very distinct species is known only from our area. It has been collected at the western end of the Llano Colorado (*J. 5651*), in Queb. de Taltal (*Philippi*, type; *J. 5103*), near Taltal (*Darapsky*), between Agua Dulce and Queb. Anchuña (*J. 5190*) and on the ridge above El Rincon (*J. 5505*). Except for the material from El Rincon which grew on a high dry ridge above the fertile belt, the plant was found growing only in dry sandy or gravelly stream-ways forming loose intricately branched shrubs 1–12 dm. tall. The species is peculiar in that it normally produces slender trifoliate leaves. The mericarps are very strongly compressed and have well developed lateral wings.

Bustillosia chilensis Clos in Gay, Fl. Chile iii. 108, t. 32, fig. 4

(1847); Ph. Fl. Atac. 25 and Viage Des. Atac. 17, 38, 199 (1860). *B. filifolia* Ph. Fl. Atac. 25 and Viage Des. Atac. 199 (1860). *Dipterygia Closii* Kuntze, Rev. Gen. ii. 267 (1891). *B. chilensis*, var. *setacea* Ph. Anal. Univ. Chile lxxxv. 711 (1894). *Asteriscium pungens* Drude in E. & P. Nat. Pflanzenf. iii. Abt. 8, 134 (1897).

North of the Caldera-Copiapó region this species is known only from the Taltal region. It is reported from near Portezuelo de las Trapaderas and Breadal by Philippi. Werdermann (no. *772*) collected it at ca. 200 m. alt. near Taltal and I found it to be a common herb on the dryish gravelly floor of Queb. Taltal (*J. 5101*) and local on dryish slopes just back of Caleta de Hueso Parado (*J. 5638*). It is a prostrate or decumbent annual with erect peduncles bearing dense globose umbels, 6–10 mm. thick, of yellow flowers.

The plant is most closely related to *Asteriscium*, but differs so greatly in gross habit as well as in flower-color and fruit-structures that it seems well worthy of generic recognition. The annual root, the widely spreading slender stems, the much divided leaves, the small distinctly yellow flowers and the much less compressed fruit are all characters which readily separate *Bustillosia* from *Asteriscium*. Reiche, Bot. Jahrb. xxviii. 10 t. 2, fig. 24 (1899), has given a good figure of the fruit in cross-section.

Domeykoa oppositifolia Ph. Fl. Atac. 25, t. 2c and Viage Des. Atac. 15, 199 (1860).

This species is known only from our area. The type, which I have examined, was obtained at Cachinal de la Costa by Philippi but the plant seems to be most common from Taltal northward. I have seen material collected at ca. 500 m. alt. near Taltal (*Werdermann 793*), from a rocky slope in a quebrada in the hills southeast of Taltal (*J. 5102*), from an elevated beach between Agua Dulce and Queb. Anchuña (*J. 5189*), from a dry gravelly ridge just above the fertile belt above El Rincon (*J. 5504*) and from moist talus in the quebrada at Ag. Miguel Diaz (*J. 5373*). The plant is a slender prostrate herb with a slender short-lived annual root. The minute petals are purple and not infrequently white towards the base.

Domeykoa perennis, sp. nov., glaberrima glaucescens; caulibus 5–15 dm. longis prostratis gracilibus teretibus ca. 1 mm. crassis numerosis stricte dichotomo-ramosis e radice valida crassa vel caudice humili laxe denseve ramoso orientibus, internodiis usque ad 8 cm. longis; foliis inferioribus alternis ceteris alternis vel rariter oppositis; petiolo laminae aequilongo vel ea duplo longiori vel rariter breviori longiorive; lamina ambitu reniformi 7.5–15 mm. longa 10–20 mm. lata ultra medium profunde trilobata vel rariter subtrifoliata; lobis

angulatis latis apice acuminatis sinu acuto sejunctis, lateralibus 3-dentatis vel rariter bilobulatis 2–3-dentatis, lobo medio ceteris subaequilongo 1–3-dentato; pedunculis oppositifoliis gracillimis 1–4 cm. longis; bracteis involucri oblanceolatis vel lineari-lanceolatis 1–2 mm. longis subbiseriatis reflexis; umbellis simplicibus 10–20-floris; pedicellis 1–1.5 mm. longis; petalis late ovatis vel obovatis 1–2.1 mm. longis 0.8–1 mm. latis albis uninerviis, apice obtusis vel breviter acuminatis saepe rectis paullo vel vix incurvis, basi in unguem brevem abrupte contractis; nervo petali supra medium in glandulam late fusiformem crassam abrupte expanso; sepalis minutis subovatis vel obcordatis non rariter dentatis ungue petali brevioribus; filamentis subulatis ca. 0.5 mm. longis; antheris subglobosis; mericarpiis 1 mm. longis angulatis prismaticis vel elliptico-prismaticis dorso planis facie commisurali sulcato et intus in semen paullo intrusis.—CHILE: crevices at head of sea-cliffs, near Aguada Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5689* (TYPE, Gray Herb.); on sea-cliffs near Aguada Grande, Dept. Taltal, Dec. 16, 1925, *Johnston 5761;* on moist gravel towards the head of the quebrada above Aguada Grande, Dept. Chañaral, Dec. 16, 1925, *Johnston 5754.*

This species, a very distinct member of the heretofore monotypic genus *Domeykoa*, differs from *D. oppositifolia* in its strong perennial root, somewhat fruticulose stems, much less dissected leaves, white petals and slightly larger flowers and fruit. It grows in the moist fog-bathed area on and near the high sea-cliffs near Ag. Cachina and Ag. Grande. The numerous wiry slightly fruticulose stems are quite prostrate or trail through low shrubbery. The petals are white and not at all purple. The fruit, except for a slight difference in size, is in all details remarkably like that of *D. oppositifolia.*

The study of this new species now makes it clear that *Domeykoa* is very closely related to *Eremocharis.* Bentham & Hooker, followed by Drude, placed the genus next to *Bowlesia.* Reiche, Bot. Jahrb. xxviii. 3, t. 1, fig. 7 (1899), properly removed it from near *Bowlesia* but erred, I believe, in associating it with *Azorella* and *Laretia.* The fruit of *Domeykoa* is quite like that of *Eremocharis* and is discussed below under *Eremocharis fruticosa.* It should be mentioned, however, that the illustration of the cross-section of the fruit of *Domeykoa oppositifolia* given by Reiche, l. c., does not entirely agree with my observations. The endocarp is shown with too thick a wall and is much less angular than I have seen it.

The characters whereby *Domeykoa* may be separated from *Eremocharis* and related genera lie in the form of the petals. *Eremocharis, Gymnophyton, Bustillosia* and *Asteriscium* all have the petals evidently

drawn out at the apex into a definite linear or ligulate appendage which is decidedly incurved or inflexed. The petals of *Domeykoa* are erect or very slightly incurved at the rounded or simply obtuse apex. As in the genera mentioned, *Domeykoa* has a conspicuous lenticular gland in the middle of each petal. From *Eremocharis* in particular, the genus *Domeykoa* differs in being prostrate rather than an upright bush, in having simple umbels borne along the stems on oppositifolious or falsely axillary peduncles rather than in compound umbels borne towards the apex of the stem, and in having white or purple unappendaged rather than yellow (or rarely purple) apically appendaged petals.

Eremocharis fruticosa Ph. Fl. Atac. 25, t. 2b and Viage Des. Atac. 12, 15, 199 (1860). *E. flexuosa* Ph. ex F. Ph. Cat. Pl. Chile 103 (1881), lapsu calami. *Dipterygia Philippiana* Kuntze, Rev. Gen. ii. 267 (1891).

This species is practically confined to our area being known outside only from near Caldera. It is a slender-stemmed very loosely branched bush growing 1–2 m. tall and appearing to be most at home on rocky cliffs or in dry gravel of stream-ways or elevated beaches. The petals are yellow. While not uncommon it has been collected only at Barquito (*J. 4764*), Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5765*), Queb. San Ramon near Taltal (*J. 5143*), Puerto Oliva (*Borchers*), between Agua Dulce and Queb. Anchuña (*J. 5192*) and between Punta Plata and Punta Buitre (*J. 5247*). Reiche, Bot. Jahrb. xlv. 347, fig. 4 (1911), reports it in the interior between Guamango and Las Animas.

Although the genus *Eremocharis* has been considered only a part of *Asteriscium* I believe that it merits full generic recognition and that it should be enlarged to include several plants of Peru which have similar habit, inflorescence and fruit. The mericarps of these species of *Eremocharis* are not compressed and are about as thick as they are broad. In shape they are prismatic or ellipsoid-prismatic, being plane or very weakly concave on the back and having plane sides (these about equalling the back in width) converging towards the narrow commissure which in turn is definitely sulcate and intrudes noticeably into the seed-cavity. The epicarp is thin and scarcely masks the angles and plane surfaces of the indurated endocarp. Five oil-tubes provide weak ribs down each angle and down the back and each side. In form and plan the fruits of the several species of *Eremocharis* are remarkably alike and practically indistinguishable from that of the genus *Domeykoa*, the genus which is probably the closest relative of *Eremocharis* and which differs only in habit of growth,

inflorescence and the form as well as the color of the petals. Such genera as *Asteriscium*, *Bustillosia* and *Gymnophyton*, with which *Eremocharis* has been associated by Bentham & Hooker and by Drude, all have dorsally compressed mericarps in which the width is much greater than the thickness. As Reiche, Bot. Jahrb. xxviii. 10 (1899), has indicated, *Eremocharis* differs from *Asteriscium* in particular, in its habit of growth, inflorescence and flower-color. The mericarps of *Asteriscium* are not prismatic but are strongly compressed and have a very deeply concave back with the margins (these at times narrowly winged) spreading, erect or even loosely revolute. The fruit of *Gymnophyton* is very strongly flattened and conspicuously winged.

The immediate relatives of *E. fruticosa* Ph. are to be found in the shrubby plants from arid parts of Peru described as members of *Asteriscium* subgenus *Gymnophytum* by Wolff, Bot. Jahrb. xl. 292 (1908). These are slender-stemmed, sparsely leafy bushes about a meter tall which produce compound umbels of yellow (and purple ?) flowers. A study in the herbarium indicates that there are other, undescribed Peruvian species of this relationship. It becomes evident, therefore, that *E. fruticosa* is an outlying species of a group prevailingly Peruvian.

Reiche, Bot. Jahrb. xxviii. t. 2, fig. 26 (1899), has given what is purported to be a cross-section of the mericarp of *E. fruticosa*. Although I have made numerous sections of the fruit, from eight different collections, I have failed to find any mericarp the cross section of which agreed with that figured by Reiche. The fruit I have examined is quite constant and none seen by me has such a thick epicarp or such a concave back. The epicarp, according to my observations, is thin and scarcely exceeds the endocarp in thickness. In medial cross-section the shape of the endocarp, not to mention the exocarp also, is much more nearly like Philippi's crude diagram. Philippi, of course, has definitely erred in failing to indicate the duplex nature of the mericarpial wall and especially the characteristic intrusion of the commissural wall into the seed.

The Index Kewensis, ii. 861 (1893), lists the generic name *Eremocharis* R. Br. in Sturt, Narrative Exped. Cent. Austr. ii. append. 73 (1849). That designation, however, occurs only in a general discussion under *Clianthus Dampieri* Cunn. where it is merely mentioned as a possible generic name in case the species should prove to be generically distinct. So casual was its publication that Bentham, Fl. Aust. ii. 214 (1864), did not bother to even mention it in his treatment of *C. Dampieri*. As the name, *Eremocharis* R. Br., was not legitimately established and has never once been characterized or even

subsequently used, in fact has never even been associated with a specific name to form a binomial, it would be most pedantic to insist that Philippi's well published name should be considered invalid because of it.

Eryngium pulchellum Ph. Fl. Atac. 25 and Viage Des. Atac. 19, 199 (1860).

This species has been collected only in the general vicinity of Taltal. I have seen collections from Hueso Parado (*Philippi*, type), from near Taltal at ca. 50 m. alt. (*Werdermann 804*), from an elevated beach at Caleta de Hueso Parado (*J. 5141*), from the gravelly floor of a quebrada in the hills southeast of Taltal (*J. 5645*) and from a dry hillside at the head of Queb. de Infieles ca. 18 km. south of Taltal (*J. 5646*). The plant is an erect annual herb usually producing a number of ascending branches. The specimens from Coquimbo and Aconcagua referred to *E. pulchellum* by Reiche, Fl. Chile iii. 96 (1902), are quite distinct and seem to be phases of *E. anomalum* H. & A.

Apium Panul (Bertero) Reiche, Anal. Univ. Chile civ. 832 (1899) and Fl. Chile iii. 111 (1902). *Ligusticum Panul* Bertero; Ph. Fl. Atac. 26 and Viage Des. Atac. 27, 200 (1860).

A white-flowered perennial growing in moist soil and developing elongate trailing stems. It is common in wet sand below the water-hole at Ag. Grande (*J. 5762*) and at Ag. Panul (*J. 5434*) grew in profusion with other lush herbs over the small streamlet there. At Ag. Miguel Diaz it was collected in the quebrada near the water-hole (*J. 5375*) and again on a rich moist bank in the fertile belt (*J. 5376*). Philippi reported it from Ag. Panul and Miguel Diaz.

Apium laciniatum (DC.) Urban in Mart. Fl. Bras. xi. pt. 1, 343 (1879). *Helosciadium deserticola* Ph. Fl. Atac. 26 and Viage Des. Atac. 15, 25, 200 (1860).

A small slender annual herb growing usually in sheltered places. It was collected at Barquito (*J. 4812*), Cachinal de la Costa (*Philippi*, type of *H. deserticola*), Taltal (*Darapsky, Werdermann 795*), Queb. San Ramon (*J. 5142*) and Ag. Miguel Diaz (*J. 5377*). Philippi reports it from Hueso Parado and Paposo. Although he gives the type locality of *H. deserticola* as Hueso Parado, the type specimen in his herbarium is labeled as from Cachinal de la Costa. In the text of his Viage he also reports the species from Cachinal de la Costa and not from Hueso Parado, so it seems probable that the locality "Hueso Parado" is incorrect. *Apium laciniatum* is very doubtfully distinct from *A. ammi* (Jacq.) Urb., a species ranging widely in South America.

Daucus montanus H. & B. ex. Schultes, Syst. vi. 482 (1820). *D. australis* of Ph. Fl. 26 and Viage Des. Atac. 19, 25, 200 (1860).

A slender weedy annual frequent on moist grassy slopes in the fertile belt. It has been collected at Hueso Parado (*Philippi*) and El Rincon (*J. 5507*). Philippi reports it from Paposo. I observed it as far north as Ag. Miguel Diaz.

PRIMULACEAE

Centunculus erectus Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860).

The type of this species was collected in the fertile belt near Paposo by Philippi. Reiche, Fl. Chile v. 100 (1910), lists the name in the synonymy of *C. pentandrus* R. Br. which is in turn treated as a synonym of *Anagallis pumila* Sw. by Pax & Knuth, Pflanzenr. [Heft 22] iv. Fam. 237, pg. 331 (1905). Philippi's plant, however, seems to be a *Centunculus* and is probably a phase of *C. minimus* L.

PLUMBAGINACEAE

Plumbago caerulea HBK. Nov. Gen. et Sp. ii. 220 (1818); Ph. Fl. Atac. 46 and Viage Des. Atac. 20, 220 (1860).

Known in our area only from Hueso Parado (*Philippi*), Queb. San Ramon (*J. 5147*) and Ag. Cardon (*J. 5282*). It is prostrate or very laxly ascending and frequents rocky places. The corolla is blue.

Limonium plumosum (Ph.) Kuntze, Rev. Gen. ii. 396 (1891). *Statice plumosa* Ph. Fl. Atac. 46, t. 6b and Viage Des. Atac. 14, 24, 26, 220 (1860).

Forming very dense strict tufted growths usually 3 (occasionally even 5) dm. tall and 5–40 cm. thick at the base. The corolla is white. The plant has been collected from "Chañaral usque ad Paposo" (*Philippi*, type), from rocky lower slopes of the hills about Barquito (*J. 4785*), from gravelly benches in Queb. San Ramon (*J. 5148*) and from gravelly stream-ways below Ag. Panul (*J. 5441*). A very extensive colony of the plant was noted on a slightly alkaline silty flat between Cachinalcito and Punta Grande. Philippi reports the species in Valle Salado back of Chañaral and from the coastal plain near Paposo. I also noted the species on the sandy slope back of Punta Reyes near Miguel Diaz.

GENTIANACEAE

Microcala quadrangularis (Lam.) Griseb. in DC. Prodr. ix. 63 (1845); Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860).

Collected by Philippi near Paposo.

Centaurium cachanlahuen (Molina) Robinson, Proc. Am. Acad. xlv. 396 (1910). *Erythraea paposana* Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860). *E. chilensis*, var. *paposana* Reiche, Anal. Univ. Chile cxviii. 332 (1906) and Fl. Chile v. 123 (1910).

Collected about shrubs on a moist rich slope in the fertile belt at El Rincon near Paposo (*J. 5524*). It was rare. Philippi collected the type of *E. paposana* in the fertile belt, probably on the fertile slopes facing Queb. Guanillo, also near Paposo.

APOCYNACEAE

Skytanthus acutus Meyen, Reise i. 376 (1834); Ph. Fl. Atac. 35 and Viage Des. Atac. 12, 14, 27, 209 (1860).

A shrub with bright yellow flowers which was found growing half buried in the dunes at Punta Plata (*J. 5249*) and at Punta Negra in Valle Salado back of Chañaral (*J. 4824*). Philippi reports it from the valley just east and from the coast just north of Chañaral.

ASCLEPIADACEAE

Cynanchum boerhavifolium H. & A. Jour. Bot. i. 294 (1834). *Cynoctonum boerhaaviaefolium* Decne.; Ph. Fl. Atac. 35 and Viage Des. Atac. 19, 27, 209 (1860).

A vine trailing in tangled masses over rocks or twining in bushes or on cactus. It has been collected near Taltal at Hueso Parado (*Philippi*), at Ag. Lora on Cerro Perales (*J. 5620*) and in Queb. San Ramon (*J. 5146*), near Puerto Oliva (*Borchers*), and near Cachinalcito (*J. 5197*). Philippi reports it from Miguel Diaz. The leaves are thick and fleshy and are very readily detached when fresh. The petals are brownish while the corona is white or pink.

Cynanchum viride (Ph.) Reiche, Anal. Univ. Chile cxviii. 159 (1906) and Fl. Chile v. 113 (1910). *Cynoctonum viride* Ph. Fl. Atac. 35 and Viage Des. Atac. 10, 12, 27, 38, 209 (1860).

A small shrub frequenting dry gravelly soil or rocky places. It forms a strictly erect bush up to 7 dm. tall or is prostrate or somewhat twining. The stems are stiff, shrubby and tend to disarticulate. The flowers are yellow. I collected the plant near Barquito (*J. 4817*), Taltal (*J. 5161*) and Paposo (*J. 5573*). Philippi reports it from Las Animas, Breadal and Miguel Diaz.

Tweedia obliquifolia (Colla) Malme, Ark. Bot. ii. no. 7, 9 (1904).

I doubtfully refer here material found climbing on cactus and over rocks on the dryish upper slopes of Cerro Perales near Taltal (*J. 5605*) and growing prostrate on a gravelly ridge crest above the fertile belt

near Ag. Miguel Diaz (*J. 5304*). The corolla is brownish green and the corona white although becoming rosy in age. The corolla-lobes are broader and the peduncles narrower than in the typical plant of central Chile.

CONVOLVULACEAE

Dichondra repens Forst. Char. Gen. Pl. 40, t. 20 (1776).

Collected near Ag. Lora on Cerro Perales near Taltal (*J. 5619*), on the ridge back of Punta Grande (*J. 5221*), on slopes about El Rincon (*J. 5523*), in the quebrada near Ag. Miguel Diaz (*J. 5313*) and on the ridges above Ag. Miguel Diaz (*J. 5312*). The plant is characteristic of moist or sheltered places and was practically confined to the fertile belt.

Convolvulus dissectus Cav. Icones v. 53, t. 480 (1799).

I refer here collections from dryish rocky seaward slopes between Agua Dulce and Cascabeles (*J. 5171*), a moist slope in the fertile belt back of Punta Grande (*J. 5208*), a dryish gravelly bench near Ag. Perales in Queb. Guanillo (*J. 5594*), moist slopes in the fertile belt near Ag. Panulcito (*J. 5468*), and the rather moist gravel on the floor of the quebrada at Ag. Cardon (*J. 5281*). The plant develops numerous slender sparsely branched prostrate stems from a strong perennial tap root. The leaves vary remarkably on each plant, the lower ones tending to be merely sinuate, the upper ones dissected. Except for a more grayish pubescence our plants are very similar to the common and variable forms of the species in central Chile. The corolla is pink.

Ipomaea chilensis A. Br. & Bouché, Ind. Sem. Hort. Berol., Appendix 1 (1857). *I. paposana* Ph. Fl. Atac. 36 and Viage Des. Atac. 23, 25, 210 (1860).

An annual herb growing in gravelly soil in the fertile belt on the ridge back of Punta Grande (*J. 5222*), near Paposo (*Philippi*, types) and on a ridge near Ag. Miguel Diaz (*J. 5311*). The plant is erect with strict stems or is somewhat twining with stems nearly a meter long.

Cuscuta purpurata Ph. Anal. Univ. Chile xc. 225 (1895).

I refer here the species of *Cuscuta* which grows in dryish areas and is frequent on a variety of hosts. I have seen collections of it from the plains near Ag. Cachina (*J. 5710*), Sierra Esmeralda (*San Roman*), Taltal (*Werdermann 852, J. 5082*) and Mal Paso north of Taltal (*J. 5170*). It is usually purplish in color and has conspicuously succulent flowers. *Cuscuta purpurata* appears to include the bulk of, if not all, the material from northern Chile that has been referred to *C. odorata* R. & P. and *C. intermedia* Choisy. The illustrations, R. & P. Fl.

Peruv. i. t. 105 (1798), Choisy, Mém. Soc. Phys. Genève ix. 275, t. 2 (1841) and Yuncker, Am. Jour. Bot. ix. 564, fig. 21 (1923), of these species all show the corollas with longer more protruding stamens than I have seen in this Chilean plant. I have accepted Philippi's name, therefore, since it belongs to the form treated here. It is of course not impossible that *C. purpurata* Ph. may be only a Chilean variety of *C. odorata* R. & P.

POLEMONIACEAE

Gilia glutinosa Ph. Linnaea xxx. 196 (1859) and Anal. Univ. Chile xc. 212 (1895); not Gray (1886). *G. ramosissima* Ph. Cat. Pl. Itin. Tarapacá 53 (1891). *G. glabrata* Ph. Anal. Univ. Chile xc. 213 (1895). *G. ramosissima*, var. *glabrata* Reiche, Anal. Univ. Chile cxx. 194 (1907) and Fl. Chile v. 153 (1910). *G. cobijanensis* Brand, Pflanzenr. [Heft 27] iv. Fam. 250, 98 (1907). *G. chachanensis* Johnston, Contr. Gray Herb. lxx. 82 (1924).

Material of this somewhat variable, albeit readily recognized species was collected in our area in gravelly places on the lower hillsides near Barquito (*J. 4815*), on a dry sandy slope just inland from Caleta de Pan de Azucar (*J. 5830*) and on the gravelly floor of the dry quebrada near Ag. Cachina (*J. 5700*). The corolla is white. The species grows in dry well drained soil from Coquimbo to southern Peru. Brand, who was followed by Reiche, has rejected the oldest name of this plant, *G. glutinosa* Ph. (1859), apparently because a better understood plant of California was given the same name by Gray in 1886. This procedure, of course, is in direct violation of the rules of priority.

Gilia laciniata R. & P. Fl. Peruv. ii. 17, t. 123 (1799); Ph. Fl. Atac. 36 and Viage Des. Atac. 210 (1860). *G. valdiviensis* Griseb. Abh. Ges. Wiss. Göttingen vi. 131 (1854).

Growing in the fertile belt on the ridge back of Punta Grande (*J. 5210*) and on the flats about the water-hole at Ag. Miguel Diaz (*J. 5390*). Werdermann (no. *839*) has collected it at ca. 400 m. alt. near Taltal and Philippi made collections which are labeled "Hueso Parado and Paposo."

HYDROPHYLLACEAE

Nama dichotomum (R. & P.) Choisy, Mém. Soc. Phys. Genève vi. 113 (1833). *N. stricta* Ph. Fl. Atac. 37 and Viage Des. Atac. 25, 211 (1860). *N. strictum*, f. *stricta* Brand, Pflanzenr. [Heft 59] iv Fam. 251, pg. 151 (1913).

The type of *N. strictum*, a mere form of *N. dichotomum*, was collected in the fertile belt near Paposo by Philippi.

BORAGINACEAE

Coldenia litoralis Ph. Fl. Atac. 37 and Viage Des. Atac. 211 (1860).

Growing on dunes or sandy places near the sea at Barquito (*J. 4806*), Caleta de Pan de Azucar (*J. 5836*), Punta Buitre (*J. 5241*), Punta Médano (*J. 5255*) and Punta Reyes (*J. 5413*). The plant is either annual or perennial and forms prostrate growths. The corolla is white tinged with pink or rarely bluish. The last three collections cited have broader and more obtuse as well as thicker leaves than the typical forms from the Caldera-Copiapó region.

Heliotropium taltalense (Ph.) Johnston, Contr. Gray Herb. lxxxi. 27 (1928). *Cochranea taltalensis* Ph. Anal. Univ. Chile xc. 349 (1895). *H. rugosum* Ph. Fl. Atac. 38 and Viage Des. Atac. 20, 24, 25, 212 (1860); not Mart. & Gal. (1844). *C. rugosa* Ph. Anal. Univ. Chile xc. 351 (1895).

An erect shrub 1–2 m. tall growing on dryish hillsides usually outside the fertile belt. It has been collected near Taltal (*Darapsky*, type of *H. taltalense; Borchers; Werdermann 837; J. 5118, 5632*), Breas (*Larrañaga*), Queb. Matancilla (*Berninger*), Paposo (*Philippi*, type of *H. rugosum; J. 5544*), Ag. Panulcito (*J. 5476*), Ag. Cardon (*J. 5293*) and Ag. Miguel Diaz (*J. 5414*). The corolla is white with a yellowish throat and outside is occasionally rose-tinged.

Heliotropium inconspicuum Reiche, Anal. Univ. Chile cxxi. 245 (1907) and Fl. Chile v. 203 (1910). *Cochranea parviflora* Ph. Anal. Univ. Chile xc. 350 (1895).

A loose globose bush 6–10 dm. tall growing in dry rocky quebradas. It has been collected only at Breas (*Larrañaga*, type), at Ag. Lora on Cerro Perales near Taltal (*J. 5631*) where only a single plant was found, and near Ag. Grande (*J. 5810, 5811*) where it was not uncommon on gravel and talus. The small corolla is white.

Heliotropium chenopodiaceum Clos, var. **ericoideum** (Miers) Reiche, Anal. Univ. Chile cxxi. 244 (1907) and Fl. Chile v. 202 (1910).

A loosely branched slender-stemmed globose bush 3–6 dm. tall growing on dry rocky slopes near the upper limit of vegetation above El Rincon (*J. 5545*) and Ag. Panulcito (*J. 5477*). The flowers are white.

Heliotropium pycnophyllum Ph. Fl. Atac. 38 and Viage Des. Atac. 15, 16, 17, 18, 212 (1860). *H. breanum* Ph. Anal. Univ. Chile xc. 357 (1895). *H. brevifolium* Ph. Anal. Univ. Chile xc. 357 (1895).

Forming a very dense globose bush 3–15 dm. tall in dry rocky or gravelly places. It has been collected near Barquito (*J. 4807*), Cachinal de la Costa (*Philippi*, type of *H. pycnophyllum*), Ag. Grande (*J. 5809*), Breas (*Larrañaga*, type of *H. breanum*), Taltal (*Werdermann 849*), Hueso Parado (*Borchers*, type of *H. brevifolium*), Queb. San Ramon (*J. 5155*) and Punta Colorado north of Paposo (*J. 5242*). The leaves are thickish and have strongly inrolled margins. The corollas are sordid white but commonly become somewhat purplish at maturity. The plant is a marked xerophyte, growing not only along the coast but in the dry interior. Philippi reports it in the desert interior south of Breas where I also noted it near Llano Colorado and in the Sierra Esmeralda.

Heliotropium linariaefolium Ph. Fl. Atac. 38 and Viage Des. Atac. 12, 15, 16, 18, 212 (1860). *H. longiflorum* Ph. Anal. Univ. Chile xc. 354 (1895).

A loosely decumbent shrub 1.5–6 dm. tall and 6–12 dm. broad growing in dryish gravel or on rocky hillsides. It grows with *H. pycnophyllum* in the arid country back of the coastal hills but is most common and characteristic on the slopes just outside of the fertile belt. It has been collected near Barquito (*J. 4750*), Las Animas (*Philippi*), Cachinal de la Costa (*Philippi*, type of *H. linariaefolium*), Ag. Grande (*J. 5808*), Ag. Cachina (*J. 5735*), Breas (*Larrañaga*, type of *H. longiflorum*), Taltal (*Borchers, Werdermann 767, J. 5119*), Queb. Matancilla (*Berninger*), Posada in Queb. Guanillo (*J. 5600*). Philippi reported it from the arid interior south of Llano Colorado and I observed it in the Sierra Esmeralda. The corolla is large and orange-colored.

Heliotropium Philippianum Johnston, Contr. Gray Herb. lxxxi. 36 (1928).

A shrub, usually somewhat supported by other bushes, and growing ca. 1.5 m. tall. It is characteristic of the fertile belt. The plant is known only from the ridge back of Punta Grande (*J. 5233*, type), Paposo (*Philippi*), Ag. Panulcito (*J. 5478*), Ag. Cardon (*J. 5294*), Miguel Diaz (*Philippi*) and Ag. Miguel Diaz (*J. 5415*). The corollas, which are fragrant, are white with a conspicuous yellow center. The collections of Philippi, which I have cited above, are those upon which he based his report of *H. linariaefolium* from Paposo and Miguel Diaz.

Cryptantha parviflora (Ph.) Reiche, Anal. Univ. Chile cxxi. 821 (1908) and Fl. Chile v. 226 (1910). *Eritrichum parviflorum* Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860).

In our area this species is known only from the two plants I found

on a gravelly terrace on a point just south of Caleta de Pan de Azucar (*J. 5837*) and from the small colony found on a dry slope in the Sierra Esmeralda just north of Portezuelo de Mina Carola (*J. 5681*). The material is quite typical.

Cryptantha subamplexicaulis (Ph.) Reiche, Anal. Univ. Chile cxxi. 826 (1908) and Fl. Chile v. 231 (1910). *Eritrichum subamplexicaule* Ph. Fl. Atac. 39 and Viage Des. Atac. 25, 213 (1860).

A plant with long slender stems, which trail through the grass, or clamber through low shrubbery in the fertile belt, forming loose mats 3–12 dm. broad and 1–2 dm. tall. It flowers the first year but appears to persist and to form a weak slender taproot and a loose fruticulose caudex. It has been collected on Cerro Perales near Taltal (*J. 5633*), near Paposo (*Philippi*, type), on Cerro Yumbes near Paposo (*J. 5562*), on slopes above El Rincon (*J. 5543*), on slopes above Ag. Panulcito (*J. 5475*), in the gulch above Ag. Panul (*J. 5448*) and in the quebrada at Ag. Miguel Diaz (*J. 5416*). I also doubtfully refer here collections from the dunes below Ag. Miguel Diaz (*J. 5411, 5412*), cf. Johnston, Contr. Gray Herb. lxxviii. 42 (1927). These collections are erect and have larger more hirsute calyces.

Cryptantha argentea Johnston, Contr. Gray Herb. lxxviii. 42 (1927).

Forming dense silvery pulvinate mats 5–30 cm. broad and growing in crevices about the head of the high foggy sea-cliffs near Ag. Grande (*J. 5814*, type) and Ag. Cachina (*J. 5734*). The root, though slender, is strong and clearly perennial.

Cryptantha chaetocalyx (Ph.) Johnston, Contr. Gray Herb. lxxviii. 43 (1927). *Eritrichum chaetocalyx* Ph. Fl. Atac. 39 and Viage Des. Atac. 10, 213 (1860).

Although given under the original description as from Pan de Azucar, the type almost certainly came from Caldera, cf. Johnston, l. c. I do not believe that the species occurs within our area.

Cryptantha filiformis (Ph.) Reiche, Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichum filiforme* Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860).

The type of this species, which is a small slender single plant, is given as having been collected at Hueso Parado by Philippi. Nothing like it has been subsequently found in our area although apparently conspecific material has been collected near Tocopilla, Iquique and Caleta Buena further north.

Cryptantha taltalensis Johnston, Contr. Gray Herb. lxxviii. 45 (1927).

An annual frequent in dry gravel on hillsides about Taltal, where

it grows associated with *C. filaginea* (*J. 5120, 5121* type, *5156, 5634, 5635*).

Cryptantha Romanii Johnston, Contr. Gray Herb. lxxviii. 46 (1927).

Known only from the type collection made in the Sierra Esmeralda in 1884 by San Roman.

Cryptantha filaginea (Ph.) Reiche, Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichium filagineum* Ph. Anal. Univ. Chile xc. 536 (1895).

This is the common *Cryptantha* of our area, being generally distributed and growing on dryish hillsides or on gravel. It has been collected near Barquito (*J. 4808*), Caleta de Pan de Azucar (*J. 5831, 5844*), Ag. Grande (*J. 5812, 5813*), Ag. Cachina (*J. 5736, 5744, 5745*), Sierra Esmeralda (*J. 5682*), Taltal (*Werdermann 809; J. 5122, 5123, 5157, 5158, 5179, 5636*), Estancia Vieja (*J. 5204*), Queb. Matancilla (*Berninger*), Paposo (*J. 5546, 5547, 5601, 6285*), Ag. Panulcito (*J. 5479, 5244*), Ag. Cardon (*J. 5295*) and Ag. Miguel Diaz (*J. 5417, 5418*).

Cryptantha glomerata Lehm. ex F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836). *Eritrichum strictum* Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860). *C. microcarpa*, var. *stricta* Reiche, Anal. Univ. Chile cxxi. 818 (1908) and Fl. Chile v. 223 (1910).

Material of this coarse northern form of *C. glomerata*, named *E. strictum* by Philippi, has been collected only on Cerro Perales near Taltal (*J. 5630*), at El Rincon (*J. 5542*), at Ag. Panul (*J. 5447*) and at Miguel Diaz (*Philippi*, type of *E. strictum*).

Pectocarya dimorpha Johnston, Contr. Gray Herb. lxxviii. 115 (1927).

A single colony of this species was found on a dry rocky hillside at the western end of the Llano Colorado (*J. 5656*).

VERBENACEAE

Verbena selaginoides Kunth ex Walp. Repert. iv. 15 (1844). *V. glauca* of Ph. Fl. Atac. 40 and Viage Des. Atac. 20, 27, 214 (1860).

An erect shrub 6–12 dm. tall growing on dry rocky slopes. It has been collected on Cerro Perales above Ag. Lora (*J. 5618*) at probably the same station at which Philippi obtained the material which he cites as from Hueso Parado at 360 m. alt. Other material has been collected at ca. 500 m. alt. near Taltal by Werdermann (no. *848*). Further north it was seen only in the dry scrub above the fertile belt at El Rincon (*J. 5509*) and above Ag. Miguel Diaz (*J. 5380*). Philippi also reported it from Miguel Diaz. The corolla is violet to lavender.

Verbena atacamensis Reiche, Anal. Univ. Chile cxxiii. 371 (1908) and Fl. Chile v. 291 (1910). *V. sulphurea* and *V. erinoides* of Ph. Fl. Atac. 40 and Viage Des. Atac. 20, 25, 214 (1860).

Referred to this species is the slender-stemmed prostrate perennial with white or pink or even purplish corollas which was collected in or just below the fertile belt at Ag. Grande (*J. 5769*), near Taltal (*Werdermann 789, J. 5104*), in Queb. San Ramon (*J. 5144, 5145*), near Paposo (*Philippi*), above El Rincon (*J. 5508*) and near Ag. Miguel Diaz (*J. 5315*) One of Philippi's two collections (that reported as *V. erinoides*) from Paposo and my collections from El Rincon and Ag. Miguel Diaz have the staminal appendages included in the corolla-throat, the other collections mentioned have them more or less extruded and are, hence, more typical of the species. I certainly do not think that these two forms are specifically distinct.

LABIATAE

Teucrium nudicaule Hook. Bot. Misel. ii. 235 (1831); Ball, Jour. Linn. Soc. xxii. 157 (1886). *T. leucanthum* Ph. Anal. Univ. Chile xc. 565 (1895). *T. nudicaule*, var. *leucanthum* Epling, Anal. Mo. Bot. Gard. xii. 114 (1925). *T. bicolor* of Ph. Viage Des. Atac. 21 (1860). *Teucrium* sp. Ph. Fl. Atac. 40 and Viage Des. Atac. 214 (1860).

A shrubby plant 1–9 dm. tall with numerous erect slender branches. It grows in dryish rocky or gravelly places outside the fertile belt. I have seen material from Taltal (*Ball*; *Borchers*, 2 collections, one the type of *T. leucanthum*), Queb. San Ramon (*J. 5133*), Queb. Guanillo near Paposo (*J. 5579*) and near Ag. Panulcito (*J. 5449*). Philippi noted the plant as occurring from Taltal to El Cobre. The corolla is white or somewhat greenish and inside is more or less streaked with purplish. Material from south of our area has the corolla somewhat darker in color but appears to be otherwise similar.

Stachys pannosa Ph. Anal. Univ. Chile xc. 564 (1895). *S. grandidentata* of Ph. Fl. Atac. 40 and Viage Des. Atac. 27, 214 (1860).

Collected in moist gravel in the quebradas at Ag. Cardon (*J. 5260*) and Ag. Miguel Diaz (*J. 5338*). Philippi also collected it at Miguel Diaz. The type of *S. pannosa*, which was collected near Paposo by San Roman, although somewhat more densely pubescent is clearly conspecific with the material I have cited above.

Stachys crenata Ph. Anal. Univ. Chile xc. 562 (1895).

An annual herb with pink flowers. It was collected on dryish gravel of the floor of the quebrada back of Barquito (*J. 4810*) and on

an elevated beach at Caleta de Hueso Parado near Taltal (*J. 5132*). A collection, apparently made by Reiche, labeled as from "Puerto Oliva" is in the herbarium at Santiago. This species differs from *S. pannosa* in lacking a silky pubescence, in having somewhat smaller corollas and in having, apparently, a less persistent root. The type from Carrizal, between Caldera and Huasco, is certainly conspecific with our plants. Doubtless it is related to some of the species from further south, as to just which one or just how closely it is impossible at present to state.

Salvia Gilliesii Benth. Lab. Gen. et Sp. 265 (1833).

A loose erect shrub 1–2.5 m. tall which is infrequent on rocky dryish slopes just above or in the upper part of the fertile belt. It was collected in the hills southeast of Taltal (*J. 5085*), on the crest of Cerro Perales near Taltal (*J. 5610*), on the upper slopes above El Rincon near Paposo (*J. 5482*), on the upper slopes above Ag. Panulcito (*J. 5450*) and on the upper ridges above Ag. Miguel Diaz (*J. 5337*). Although a large bush with bright blue flowers and widely distributed in our area the plant, for some inexplicable reason, does not appear to have been collected here by others, and is now for the first time reported from Chile. Det. by Dr. C. Epling.

Salvia paposana Ph. Fl. Atac. 39 and Viage Des. Atac. 20, 25, 27, 213 (1860). *S. rhombifolia* R. & P., var. *Philippii* Klotz. Linnaea xxix. 732 (1858).

Because of the advanced maturity of the plant no material was collected. It is an annual and is not uncommon north of Taltal. Philippi's type at Santiago is labeled "Hueso parado, Paposo, etc." Philippi also reports it from Miguel Diaz, where I also observed it. According to Dr. Epling, *in lit.*, the species ranges north to Peru and although closely related to *S. rhombifolia* R. & P. appears to differ in its taller more slender habit of growth, thinner somewhat acutish glabrous or subglabrous leaves, and slightly smaller sparsely hirtellous calyx.

Salvia excisa R. & P. Fl. Peruv. i. 25, t. 36a (1798). *S. chilensis* Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 45 (1858). *S. tubiflora* of Ph. Fl. Atac. 39 and Viage Des. Atac. 15, 16, 21, 25, 27, 213 (1860).

A weak upright shrub 6–12 dm. tall growing in moist soil usually in the fertile belt. The corolla is scarlet. I have seen material from "Cachinal de la Costa, Paposo" (*Philippi*), Paposo (*San Roman*), Ag. Cardon (*J. 5261*) and Ag. Miguel Diaz (*J. 5336*). I also observed the plant at Ag. Cachinalcito and on the fertile slopes at El Rincon. Philippi reports it from Estancia Vieja. *Salvia chilensis* is based upon specimens grown from seeds collected at Paposo. Dr. Epling has

determined our material as *S. excisa* R. & P. writing that the species is closely related to *S. tubiflora* Sm. and distinguished chiefly by being somewhat glandular on the lower leaf-surfaces.

Mentha piperita L. Sp. Pl. 576 (1753); Ph. Fl. Atac. 39 and Viage Des. Atac. 26, 213 (1860).

Philippi reported this species from Ag. Panul. I noted a mint there and at Ag. Miguel Diaz but finding no flowers failed to collect it. Philippi's material appears to be lost. The determination of the species is, hence, open to doubt.

NOLANACEAE

Nolana lepidophylla (Ph.), comb. nov. *Ostcocarpus lepidophyllus* Ph. Anal. Univ. Chile xci. 42 (1895). *Alona lepidophylla* Reiche, Anal. Univ. Chile cxxv. 497 (1910) and Fl. Chile v. 425 (1910).

There is a thoroughly typical specimen of this species in the Philippi Herbarium with data as follows—"Pan de Azucar, D." The initial is probably that of Darapsky. The locality "Pan de Azucar" is indefinite and perhaps may refer to a place near Carrizal Bajo, between Caldera and Huasco, rather than the well known locality in our area.

I am accepting the genus *Nolana* as characterized by having a lobed fruit which at maturity breaks apart forming 3–10 nutlets. In situ these nutlets are uniseriate and are more or less broadly joined together ventrally. In these regards it differs from *Bargemontia* in which the nutlets (usually smaller and ovoid) are distinct from one another and are affixed by a basal or subbasal attachment directly to the receptacle. *Periloba* differs from *Nolana* in having multiseriate nutlets. To *Nolana,* besides the typical species such as *N. prostrata* L. and its allies which are mostly Peruvian, I would also refer to the genus as synonyms, *Alona* Lindl. (1844), *Rayera* Gaud. (1842–46), ? *Velpeaulia* Gaud. (1842–46) and *Ostcocarpus* Ph. These generic names just mentioned all apply to the narrow-leaved Chilean shrubs treated as species numbers 1–7 by Reiche, Fl. Chile v. 422–26 (1910).

Nolana stenophylla, sp. nov., fruticosa laxe decumbens 1.5–3 dm. alta 3–12 dm. diametro pilis abundantibus multicellularibus glanduliferis brevibus villosula; ramis ultimis 1–2 dm. longis 1.5–2.5 mm. crassis fruticulosis erectis, internodiis 1–3 cm. longis; ramulis rariter elongatis plerumque ad axillas foliorum ramorum fasciculos foliorum formantibus; foliis linearibus compressis carnosis saepe 1.5–3.5 cm. longis 1.3–2.3 mm. latis vix nervatis concoloribus apice rotundis ad basem versus paullo attenuatis; floribus in axillis foliorum solitariis; pedicellis ad anthesim 5–20 mm. longis ascendentibus

gracilibus, fructiferis robustioribus 1–4 cm. longis contortis deflexis; calyce ad anthesim 15–20 mm. longo, tubo cupulato ca. 6 mm. longo 8–10 mm. diametro, lobis lanceolatis acuminatis ascendentibus; calyce fructifero accrescenti 2–2.5 cm. longo; corolla caerulea 2.8–3.5 cm. longa calyce subduplo longiori, tubo ca. 5 mm. longo ca. 2 mm. crasso cylindrico apice in fauces campanulatas ca. 19 mm. longas abrupte expanso in calyce occulto intus villoso, lobis ascendentibus ca. 7 mm. longis ut videtur rotundis; filamentis 5 mm. supra basem corollae affixis 4 et 7 mm. longis glabris; stylo ca. 1 cm. longo; fructu 4–5-lobato 9–12 mm. diametro ca. 5 mm. alto maturitate in nuculos 4–5 uniseriatos paullo inaequales dorso laevissimos grosse umbonatos apice abrupte acuminatos ventre ubique cicatricosos angulatos disruptante.—CHILE: on the rocky and bushy diluvial fan at the mouth of the quebrada just below Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5272* (TYPE, Gray Herb.).

This species is probably most closely related to *N. Gayana* (Gaud.) Johnston, agreeing with that species in the form of its corolla and in its elongate leaves. The nutlets in *N. stenophylla*, however, are twice as large and are acuminate at the apex and the narrower more succulent leaves are very obscurely if at all revolute. The nutlets in the new species are very characteristic. They are simply parts of a disrupted 4–5-lobed fruit. The ventral half of the nutlet, by which it is affixed, is strongly convex or angled and after becoming detached is irregularly roughened. The back is prominently umbonate and quite smooth. The tip of the nutlet is drawn up into a beak usually 1–2 mm. long. The nutlets in *N. Gayana* are affixed by a medioventral areola and are ellipsoid. The leaves, stems and calyces in the new species are a rather abundantly glandular-villous.

Periloba longifolia (Lindl.), comb. nov. *Alona longifolia* Lindl. Bot. Reg. xxx. sub t. 46 (1844). *Sorema elegans* Ph. Fl. Atac. 43 and Viage Des. Atac. 16, 17, 25, 38, 217 (1860). *S. bracteosa* Ph. Fl. Atac. 43 and Viage Des. Atac. 217 (1860).

I refer here the succulent herb which is frequent on foggy slopes in the fertile belt. Collections have been seen from near Barquito (*J. 4768, 4769*), Cachinal de la Costa (*Philippi*, type of *S. bracteosa*), Ag. Grande (*J. 5770*), Breas (*Larrañaga*), Taltal (*Werdermann 769*), El Rincon (*J. 5511*), Paposo (*Philippi*, type of *S. elegans*) and Ag. Miguel Diaz (*J. 5383*). The plants in our area are supposed to represent at least two species. I have not only been unable to distinguish these, but have completely failed to find even reasonably constant characters which would separate our plants from the immediately related ones from further south. Accordingly under the name *P. longi-*

folia, the oldest specific name applied to any species of this immediate relationship, I have placed such proposed species as *S. lanceolata* Miers, *S. acuminata* Miers, *S. glutinosa* Ph., *Nolana angustifolia* Ph., *N. napiformis* Ph., etc. By thus enlarging the scope of *P. longifolia* and admitting to it considerable variation a definable unit is obtained and the species becomes comparable with such outstanding species as *Periloba paradoxa* Raf. (*N. paradoxa* Lindl.), **P. baccata** (*Alona baccata* Lindl. = *S. linearis* Miers! and *N. Carrerae* Ph!), **P. pterosperma** (*N. pterosperma* Ph.) and **P. parviflora** (*S. parviflora* Ph.). *Periloba longifolia* is very variable in the amount of pubescence, in the attachment of the leaves and in the size of the corolla. In our area I found that the corolla, which is a very rich and beautiful blue, varies from 3 to nearly 6 cm. in length according to the nutrition of the particular plant.

The generic name *Periloba* Raf., Fl. Tell. iv. 87 (1838), was based upon *Nolana paradoxa* Lindl. as illustrated in the Botanical Magazine, lii. t. 2604 (1825), and Botanical Register, x. t. 865 (1824). Strangely this generic name, although legitimately established and unmistakable as to its application, has been incorrectly cited by numerous authors as a synonym of the liliaceous genus *Nothoscordum*. When *Nothoscordum* was added to the list of Nomina Conservanda at Brussels in 1910 *Periloba* was actually listed as a nomen rejiciendum. *Periloba*, having the same type-species as *Sorema* Lindl. (1844), is clearly synonymous and since it has unquestionable priority must be taken up in place of it. *Gubleria* Gaud. (1842–46), based upon *Alona baccata*, is also a synonym.

Periloba sessiliflora (Ph.), comb. nov. *Nolana sessilifolia* Ph. Anal. Univ. Chile xci. 32 (1895).

The type of this species was collected by San Roman in the Sierra Esmeralda. I am uncertain as to the precise relationships of this plant.

Periloba stans (Ph.), comb. nov. *Nolana stans* Ph. Anal. Univ. Chile xci. 31 (1895).

Reported from near Paposo by Reiche, Fl. Chile v. 416 (1910) and Bot. Jahrb. xlv. 344 (1911). The determination is probably not correct.

Bargemontia glauca, sp. nov., fruticosa laxe decumbens glaberrima ramosa; ramulis 1–1.5 dm. longis usque ad 2.5 mm. crassis glaucescentibus, internodiis saepe 5–10 mm. longis; foliis fasciculatis anguste spathulatis carnosis subteretibus 5–15 mm. longis 1–2.5 mm. latis glaucescentibus apice rotundis vel obtusis; floribus saepe 2 e fasciculis foliorum erumpentibus; pedicellis gracilibus 4–5 mm. longis;

calyce obconico-poculiformi glaucescenti ad anthesim ca. 5 mm. longo extus glaberrimo intus pilis sparsis rigidiusculis brevibus glanduliferis ornato, dentibus triangularibus 1–2 mm. longis; corolla alba infundibuliformi ca. 1 cm. longa extus glaberrima, tubo cylindrico 3–3.5 mm. longo per calycem occulto, faucibus abrupte expansis 3–4 mm. longis ad 4–5 mm. diametro, lobis late triangularibus obtusis ca. 4 mm. latis ad 3 mm. longis ascendentibus; filamentis inclusis 2–2.5 mm. supra basem corollae affixis 5 et 6 mm. longis ad basem versus paullulo expansis et incrassatis, partibus inferioribus et decurrentibus dense villoso-ciliatis, partibus mediis et superioribus glaberrimis; antheris ellipticis 1.5 mm. longis; stylo ca. 1 cm. longo; receptaculo patuliformi obscure lobato extus longitudinaliter sulcato; nuculis 5–8 uniseriatis basi affixis maturitate ignotis.—CHILE: a pale sprawling shrub on the upper slopes of the hills directly back of Barquito, Dept. Chañaral, Oct. 29, 1925, *Johnston 4770* (TYPE, Gray Herb.).

The glaucous, entirely glabrous herbage of this species is probably unique in the family and readily distinguishes the plant from other members of its genus. It belongs with those species of *Bargemontia* which have the base of the filaments very villous and usually somewhat thickened. These species may be broken up into three groups determined by whether the plant is glabrous or not and, if not, whether the hairs are simple or forked. The species with an indument of forked hairs are *B. peruviana*, *B. crassulifolia*, *B. eremobia* and *B. albescens*. Most closely related to these species, although glabrous or nearly so, are *B. clavata* and *B. glauca*. Among the species with an indument of simple hairs are *B. divaricata*, ? *B. micrantha*, *B. mollis*, *B. flaccida* and *B. linearifolia*. These latter species differ much in habit. *Bargemontia glauca* is distinguished from *B. clavata* by its sprawling habit, white corollas and glaucous herbage.

The genus *Bargemontia* is here taken to include plants which for the most part have been referred by past authors to *Dolia* Lindl. (1844), *Aplocarya* Lindl. (1844), *Alibrexia* Miers (1845) and *Leloutrea* Gaud. (1842–46). It is characterized by its relatively small, ovoid or subglobose, basally attached, distinct, uniseriate nutlets. The name *Bargemontia* is here accepted in place of the more familiar *Dolia* since it has definite priority, having certainly been published previous to 1842, cf. Isis von Oken, 626 (1842), and probably about 1840 since according to Weddell, DC. Prodr. xvi. pt. 1, 235[22] (1869), some of Gaudichaud's plates were published as early as 1839. As to the validity of genera based upon Gaudichaud's plates see the discussion by Sprague, Kew Bull. 395 (1928).

Bargemontia clavata (Miers), comb. nov. *Dolia clavata* Miers

in Hook, London Jour. Bot. iv. 503 (1845) and Illus. S. Am. Pl. i. 56 (1850).

A very dense globose bush ca. 1 m. tall growing on a dry gravelly bench near the water-hole at Ag. Cachina (*J. 5694*). The herbage is glabrous and light green. The leaves are spathulate and nearly terete. The corolla is blue. The species is very closely related to *B. peruviana* of Antofagasta and Cobija, a plant which differs not only in its much more northern detached range but also in having its herbage covered with a dense canescent indument of forked hairs and perhaps also in a somewhat shorter more cylindrical corolla. The type-collection of *B. clavata*, i.e. *Bridges 1324*, came from near the coast between Huasco and Coquimbo and was given by its collector as having pale blue corollas and being a bush 6–9 dm. tall!

Bargemontia sphaerophylla (Ph.), comb. nov. *Alona sphaerophylla* Ph. Fl. Atac. 44 and Viage Des. Atac. 12, 218 (1860).

The type, which is the only known collection of this curious plant, was obtained by Philippi near Las Animas. The habit of the plant clearly shows its relations in the present genus. I was unable to make floral dissections of the type but believe that it has villous filaments and that it is related to *B. clavata* and *B. glauca.*

Bargemontia crassulifolia (Poepp.), comb. nov. *Nolana crassulifolia* Poepp. in Froriep, Notizen xxiii. 276 (1829). *Alona tomentosa* Lindl. Bot. Mag. xxx. sub t. 46 (1844). *Alibrexia rupicola* Miers in Hook. London Jour. Bot. iv. 506 (1845) and Illust. S. Am. Pl. i. 59, t. 11 (1850). *Alibrexia incana* Ph. Fl. Atac. 45 and Viage Des. Atac. 18, 24, 25, 219 (1860). *Alibrexia breviflora* Ph. Linnaea xxxiii. 208 (1864). *Dolia grandiflora* Ph. Anal. Univ. Chile xci. 44 (1895). *Dolia crassifolia* Kuntze, Rev. Gen. iii. 216 (1898).

The type of *Alibrexia incana* was collected by Philippi near the shore at Paposo. Although it was described as an erect bush ca. 4.5 dm. tall the position of the leaves and flowers in the type-specimens seem to indicate that the plant was widely spreading or prostrate. *Bargemontia crassulifolia* occurs near the sea in the region about Valparaiso. To the north it seems to be represented only by the type of *A. incana* and by a collection made by Gigeoux near Caldera. The filaments are quite villous at the base. The indument on the herbage, as in the following species, consists of forked hairs.

Bargemontia eremobia (Ph.), comb. nov. *Dolia eremobia* Ph. Anal. Univ. Chile xci. 45 (1895).

A pallid shrub with decumbent, sprawling or prostrate stems which form mats or occasionally low-domed masses 1–4.5 dm. tall and 5–30 dm. broad in dry gravelly soils. It has been collected near

Posada Hidalgos (*J. 5662*), Breas (*Larrañaga,* type), Queb. San Ramon (*J. 5128*) and Paposo (*J. 5569*). The corolla is yellowish and has villous filaments. Perhaps this species should be associated with *Alibrexia incana* Ph., the type of which came from Paposo. That species, however, has a larger calyx with a deeper calyx-tube, a larger corolla, numerous short (1–2 dm.) stiff ascending branches and a less firm darker indument. In all these characters *A. incana* seems much nearer *B. crassulifolia. Bargemontia eremobia* seems much more closely related to **B. albescens** (*Dolia albescens* Ph.) of the Caldera-Copiapó region. The latter species has a firmer and denser indument and appears to be an erect bush about a meter tall. It is usually infested with ants which appear to use as domatia certain gall-like thickenings on the branchlets. *Bargemontia eremobia* is not a myrmecophyte.

Bargemontia micrantha (Ph.), comb. nov. *Alona micrantha* Ph. Fl. Atac. 44 and Viage Des. Atac. 16, 218 (1860). *Dolia micrantha* Reiche, Anal. Univ. Chile cxxv. 503 (1910) and Fl. Chile v. 431 (1910). *D. hirsutula* Ph. Anal. Univ. Chile xci. 46 (1895).

Collected near Cachinal de la Costa (*Philippi*, type of *A. micrantha*) and near Breas (*Larrañaga*, type of *D. hirsutula*). The species seems to be very closely related to the following:

Bargemontia divaricata (Lindl.), comb. nov. *Aplocarya divaricata* Lindl. Bot. Reg. xxx. sub t. 46 (1844). *Dolia divaricata* B. & H. ex Wettst. in E. & P. Nat. Pflanzenf. iv. Abt. 3b, 4 (1895). *Alona xerophila* Ph. Fl. Atac. 44 and Viage Des. Atac. 17, 218 (1860). *Alona rigida* Ph. Anal. Univ. Chile xci. 38 (1895). *Osteocarpus spathulatus* Ph. Anal. Univ. Chile xci. 41 (1895).

I refer to this species the xerophytic bush I observed in the Sierra Esmeralda in the dry gravelly bed of the quebrada just north of Portezuelo de Mina Carola (*J. 5675*). It is a stiff shrub 4–10 dm. tall and clearly conspecific with material collected at Cachiyuyal (*Philippi*, type of *A. xerophila*) and in the Sierra Esmeralda (*San Roman*, type of *A. rigida*). These three collections come from a small natural area in the very arid interior and seem to represent merely a xerophytic phase of *B. divaricata.* A collection from ca. 400 m. alt. near Taltal (*Werdermann 834*) is more nearly typical of *B. divaricata* having more slender and less stiff branchlets. My collection from the Sierra Esmeralda is in advanced fruiting. I have been able to examine, however, a few persistent old corollas and find them indistinguishable from those of *B. divaricata.* The filaments are decidedly villous. The pubescence on the stems in *B. divaricata* is composed of long slender somewhat curly simple hairs which form

a sparse cottony oily indument. In *A. xerophila* and *A. rigida* the pubescence is largely restricted to the nodes and to the growing parts. *Osteocarpus spathulatus* is a form of *B. divaricata* with a conspicuous pubescence.

Bargemontia mollis (Ph.), comb. nov. *Alona mollis* Ph. Fl. Atac. 44 and Viage Des. Atac. 16, 24, 38, 218 (1860). *Dolia macrocalyx* Ph. Anal. Univ. Chile xci. 45 (1895).

A rather succulent shrub with a slimy indument of long simple hairs. It forms a globose bush 1–1.5 m. tall or has decumbent or sprawling stems forming masses 3–6 dm. tall and 6–12 dm. broad. The large corolla is violet or very pale bluish and is villous at the base of the filaments and in the tube. It has been collected only on hillsides near Barquito (*J. 4771*), on a sandy stream-way at Caleta de Pan de Azucar (*J. 5835*), near Cachinal de la Costa (*Philippi*, type of *A. mollis*), on gravelly benches and stream-ways about Ag. Cachina (*J. 5695*) and near Taltal (*Borchers*, type of *D. macrocalyx; Vidal*). The species is a very distinct one and is probably most closely related to the following, with which it agrees in its cylindrical merely toothed calyces and large corollas.

Bargemontia flaccida (Ph.), comb. nov. *Alona flaccida* Ph. Anal. Univ. Chile xci. 39 (1895). *A. patula* Ph. l. c.

A loosely and very widely branched, prostrate, pale green shrub 1.5–3 dm. tall and 10–20 dm. broad, growing on the sandy floor of the quebrada-mouth at Caleta de Pan de Azucar (*J. 5834*). The plant has glabrous stems and leaves, although occasionally a very few simple hairs are to be found on the calyces and growing parts of the stems. The conspicuous pale lilac corollas are villous towards the base within as are also the bases of the filaments. The species is known only from Valle Salado (*San Roman*, type of *A. flaccida*), Caleta de Pan de Azucar (*J. 5834*) and eastward in the arid interior at Carrizalillo (*Harding*) and Juncal (*San Roman*, type of *A. patula*). In publishing *A. patula* Philippi also reports the species from Queb. de Chaco north of Juncal. In his herbarium, however, I did not find any specimens labeled as from that locality.

Bargemontia linearifolia (Ph.), comb. nov. *Nolana linearifolia* Ph. Anal. Univ. Chile xci. 28 (1895). *N. decemloba* Herzog, Mededeel. Rijks Herb. no. 29, 20 (1916).

The type of Philippi's species was collected by San Roman in the Sierra Esmeralda. Apparently conspecific is a plant which grows well above the fertile belt on the extremely arid crests at about the upper limit of vegetation on the ridge above Ag. Panulcito (*J. 5461*). This plant differs from Philippi's type only in being somewhat more

abundantly glandular-puberulent on the stems and leaves and in having the corolla somewhat smaller. It is pale green and glandular-puberulent and has trailing stems and succulent linear leaves. It has a long tap-root and is apparently perennial. The blue corolla is variable in size, ranging from 12–24 mm. in length, and has deeply notched lobes. The corolla-tube is villous within. The species also occurs about Antofagasta. It is most closely related to *B. mollis*, *B. flaccida* and **B. tarapacana** (*Dolia tarapacana* Ph.). The deeply notched corolla-lobes distinguish it readily from its relatives.

Bargemontia aplocaryoides (Gaud.), comb. nov. *Leloutrea aplocaryoides* Gaud. Voy. Bonite, Bot. Atlas tab. 110 (1842–46). *Alona pusilla* Ph. Fl. Atac. 45 and Viage Des. Atac. 16, 219 (1860).

An erect annual herb which is ascendingly branched above the middle. The stems and foliage are covered with a clammy indument of simple spreading hairs. The lavender corolla is completely glabrous inside. The plant grows 2–4 dm. tall and frequents dry sand and gravel near the coast throughout our area. It has been collected near Barquito (*J. 4814*), Taltal (*Werdermann 774*) and Punta Buitre (*J. 5243*).

Bargemontia sedifolia (Poepp.), comb. nov. *Nolana sedifolia* Poepp. in Froriep, Notizen xxiii. 276 (1829). *Fabiana lanuginosa* H. & A. Bot. Beechey Voy. 35 (1830). *Dolia vermiculata* Lindl. Bot. Reg. xxx. sub t. 46 (1844).

An erect globose bush 5–12 dm. tall collected on a rocky hillside near the crest of the hills back of Barquito (*J. 4767*), in dry rocky place near crest of Cerro Yumbes near Paposo (*J. 5551*) and on the rocky floor of the gulch just below Ag. Panul (*J. 5435*). The elongate corolla is white and is practically glabrous within. The tomentose pubescence on the stems and leaves is composed of simple hairs.

Possibly representing a variety or even a distinct species is material from the gravelly coastal plain near Paposo (*J. 5570*) and from the dry ridge-crest above Ag. Miguel Diaz (*J. 5384*). The plant is depressed or prostrate forming masses of stems 3–9 dm. broad and 0.5–1.5 dm. tall. The corolla is pale bluish and the tube barely surpasses the calyx. The leaves and pubescence are similar to those of typical *B. sedifolia.*

Bargemontia deflexa, sp. nov., fruticosa pilis brevibus inconspicuis glanduliferis simplicibus abundanter ornata; ramulis gracilibus usque ad 1.5 mm. crassis cortice pallido obtectis, internodiis 1–5 mm. longis; foliis linearibus vix fasciculatis 1–2 cm. longis ad 1 mm. latis obtusis crassiusculis erectis vel ascendentibus; floribus in axillis solitariis; pedicellis ad anthesim gracilibus 3–6 mm. longis erectis vel

stricte ascendentibus, fructiferis robustioribus usque ad 1 cm. longis ad basem versus arcuate deflexis; calyce ad anthesim ca. 12 mm. longo, tubo subcylindrico ca. 5 mm. longo 3–4 mm. crasso, lobis subulatis inaequalibus 6–7 mm. longis erectis; corolla caerulea 15 mm. longa basi 2 mm. crassa ad summam partem gradatim expansa et ad 12 mm. crassa extus pilis brevibus sparsis glanduliferis ornata intus glabra sed ad basem versus plus minusve glandulifera, lobis brevibus ascendentibus latissime triangularibus obtusis 1–2 mm. longis 2–2.5 mm. latis, sinubus subplicatis; filamentis anguste subulatis glabris ca. 4 mm. supra basi corollae affixis decurrentibus 4 et 5 mm. longis; receptaculo 5-dentato; nuculis 3–8 subglobosis 2–2.5 mm. diametro nigris basi affixis uniseriatis.—CHILE: Carrizalillo, Dept. Chañaral, 1921, *J. E. Harding* (TYPE, Gray Herb.).

This belongs to the group of species with the base of the filaments and the inner surface of the corolla-tube glabrous or merely sparsely villous. These species are prevailingly more northern than are their congeners with villous filaments and include among their number the several Peruvian species of the genus. The principal Chilean species are *B. villosa*, **B. deserticola** (*Alona deserticola* Ph.), **B. foliosa** (*Dolia foliosa* Ph.), *B. aplocaryoides*, *B. salsoloides* and *B. sedifolia*. *Bargemontia villosa* has a copious loose indument of forked hairs. *Bargemontia deserticola* has simple or a mixture of simple and forked hairs. The remaining species have an indument of simple hairs or are glabrous. The species just described is probably most closely related to *B. foliosa* but is quite distinct. It is characterized by its very slender leaves and conspicuously deflexed fruiting pedicels. It is known only from a fragmentary collection made at Carrizalillo, a locality in the arid interior on the eastern border of our area northeasterly from Caleta de Pan de Azucar.

Bargemontia salsoloides (Lindl.), comb. nov. *Dolia salsoloides* Lindl. Bot. Reg. xxx. t. 46 (1844); Ph. Fl. Atac. 44 and Viage Des. Atac. 24, 25, 218 (1860).

A dense light-green succulent globose bush 1–1.5 m. tall. It was collected on a seaward slope at the mouth of Queb. San Ramon near Taltal (*J. 5167*) and near the mouth of Queb. Guanillo near Paposo (*J. 5590*). The elongate corollas are bluish and are glabrous within. The only other material I have seen that is conspecific is a collection made near Paposo by Philippi. The plant illustrated by Gaudichaud, Voy. Bonite, Bot. Atlas tab. 113 (1842–46), is quite like the plant from Taltal and Paposo. Only material from the northern coast seems to agree with the original description of *D. salsoloides*. This was based upon a plant collected by Macrae in "Chile," prob-

ably during the stop of some coastal boat at Taltal or Cobija. Although apparently glabrous to the naked eye, the plant has the leaves and branchlets beset with short inconspicuous simple gland-tipped hairs.

Bargemontia villosa (Ph.), comb. nov. *Alibrexia villosa* Ph. Fl. Atac. 45 and Viage Des. Atac. 16, 38, 219 (1860). *Dolia villosa* Reiche, Anal. Univ. Chile cxxv. 503 (1910) and Fl. Chile v. 431 (1910).

A pallid plant with decumbent branches forming depressed masses 1–2.5 dm. tall and 3–20 dm. broad. Except near Ag. Panulcito where it was found on the very arid ridge-crests above the fertile belt, the plant was observed only in the gravel of dry stream-ways. It is not noticeably succulent. The corollas are white or rarely pink and are sparsely villous to quite glabrous within. The indument on the stems and leaves consists usually of very abundant soft dendritic or forking hairs. The plant has been collected in our area at Cachinal de la Costa (*Philippi*), Posada Hidalgos (*J. 5663, 5664*), western end of the Llano Colorado (*J. 5653*), Breadal (*Philippi*, type), Breas (*Larrañaga*), Valle de la Brea (*Darapsky 38*), near Caleta de Hueso Parado (*J. 5639*) and near Ag. Panulcito (*J. 5462*).

SOLANACEAE

Lycium deserti Ph. Fl. Atac. 43 and Viage Des. Atac. 217 (1860). *L. desertorum* Ph. Viage Des. Atac. 17 (1860). *L. breanum* Ph. Anal. Univ. Chile xci. 23 (1895).

A spinescent shrub 1–2.5 m. tall growing on the dryish rocky slopes above the fertile belt near Ag. Miguel Diaz (*J. 5382*). I have seen only two other collections, the type of *L. deserti* secured by Philippi between Cachiyuyal and Hueso Parado and the type of *L. breanum* obtained by Larrañaga near Breas. Reiche, Bot. Jahrb. xlv. 343 (1911), however, reports it from the fertile belt near Paposo. Except for this latter record the species is known only from very arid localities. It is endemic to our area unless it prove to be synonymous with *L. fragosum* Miers, Ill. So. Am. Pl. ii. 108, t. 67d (1857), which was collected at Cobija, Iquique or Arica.

Grabowskia glauca (Ph.), comb. nov. *Lycium glaucum* Ph. Fl. Atac. 43 and Viage Des. Atac. 19, 20, 217 (1860).

A pallid shrub 1–2 m. high which grows on dry hillsides about the base of Cerro Perales just northeast of Taltal. At the southwest base of the cerro it was found to be locally frequent along the trail between Agua Perales and Caleta de Hueso Parado (*J. 5608*). It is probably at this station that Philippi collected his type, which he

cites as from "Hueso Parado." Another colony of the shrub was encountered in Queb. San Ramon on the north base of Cerro Perales (*J. 5127*). The flowers and mature fruit of the plant were collected. These prove the plant to be unquestionably a species of *Grabowskia* and probably most closely related to the Brazilian *G. Lindleyi* Miers.

Physalis pubescens L. Sp. Pl. 183 (1753); Ph. Fl. Atac. 41 and Viage Des. Atac. 215 (1860).

Reported by Philippi as growing at Ag. Perales in Queb. Guanillo near Paposo. I have not seen his specimens. These are probably conspecific with the plants of central Chile which Reiche, Fl. Chile v. 323 (1910), treated as *P. peruviana* L.

Solanum brachyantherum Ph. Anal. Univ. Chile xliii. 522 (1873).

This small-flowered species is not uncommon in gravelly soil in quebradas and on slopes in and below the fertile belt. It has been collected at Barquito (*J. 4813*), Taltal (*Werdermann 841*) and near Ag. Cardon (*J. 5273*).

Solanum Remyanum Ph. Cat. Pl. Itin. Tarapacá 66 (1891). *Witheringia flexuosa* Remy in Gay, Fl. Chile v. 70 (1849), not *S. flexuosum* Willd.

Growing on rocky or gravelly slopes below the fertile belt. It has been collected at Barquito (*J. 4766*), Taltal (*J. 5068, Werdermann 836*) and between Cachinalcito and Queb. de las Tunas (*J. 5193*).

Solanum phyllanthum Cav. Icones iv. 35, t. 359 (1797). *S. paposanum* Ph. Fl. Atac. 42 and Viage Des. Atac. 25, 216 (1860).

Growing on rich grassy slopes in the fertile belt. It is a perennial from a stout root and has several stems, which sprawl or trail through the grass or low bushes. The corolla is bluish. It has been collected at the head of the sea-cliffs near Ag. Cachina (*J. 5693*) and on the hills near Paposo (*Philippi*, type of *S. paposanum*), Rincon (*J. 5510*) and Ag. Miguel Diaz (*J. 5381*). The material from Ag. Cachina and Ag. Miguel Diaz has much more abundantly and deeply lobed leaves than does the material from the other two stations. These latter two are typical of *S. paposanum*.

Solanum chilense (Dunal) Reiche, Anal. Univ. Chile cxxiv. 742 (1909) and Fl. Chile v. 358 (1910). *Lycopersicum atacamense* Ph. Fl. Atac. 42 and Viage Des. Atac. 21, 25, 216 (1860).

A sprawling herbaceous perennial which is very variable in leaf-cutting and which may be no more than a southern variety of *S. peruvianum* L. It is not infrequent on dryish gravelly soil along the coast north of Taltal. It has been collected near Taltal (*J. 5607*), Breas (*Larrañaga*), Paposo (*Philippi*, *Johnston 5589*).

Nicotiana Miersii Clos in Gay, Fl. Chile v. 56 (1849); Ph. Viage 12 (1860).

Philippi reports this from Las Animas. I have not seen the specimens.

Nicotiana solanifolia Walp. Repert. iii. 12 (1844); Ph. Fl. Atac. 41 and Viage Des. Atac. 19, 20, 25, 26, 27, 215 (1860).

This very distinctive plant is confined to the fertile belt. It forms a coarse erect woody frame-work of branches 2–10 dm. tall from which arise the leafy flowering shoots. These are subsimple and 4–10 dm. long. The elongate corolla is yellow with the limb greenish and reflexed. The plant has been collected in our area only at Barquito (*J. 4751*), Hueso Parado (*Philippi*) and Miguel Diaz (*J. 5340*), although it is present on most every moist fog-bathed slope. South of our area it has been collected about Caldera and Carrizal Bajo. The species, hence, has about the same range as *Euphorbia lactiflua* Ph. The type of *N. solanifolia* Walp. is said to come from the "Port of Penna blanca," perhaps the Caleta de Peña Blanca which is about 35 km. south of Huasco. *Nicotiana breviloba* Jeffreys, a closely related if not synonymous species, to judge from the description, is said to come from Coquimbo. I have not seen any plants of the present relationship from south of Carrizal Bajo. Our plant, may range to Coquimbo or may possibly be distinct from true *N. solanifolia*, and in that case should be called *N. cardiophylla* Ph. The latter species was based upon material from near Caldera.

Salpiglossis chilensis (Gay) Wetts. in E. & P. Nat. Pflanzenf. iv. Abt. 3b, 36 (1895). *Reyesia chilensis* Gay; Ph. Fl. Atac. 36 and Viage Des. Atac. 19, 210 (1860).

A slender-stemmed, intricately branched herbaceous perennial 2–4 dm. tall which grows in rocky places in the hills southeast of Taltal (*J. 5084*) and further south at the western end of the Llano Colorado (*J. 5650*). It has also been collected at Breas by Larrañaga and near Taltal by Werdermann (no. *821*) and Philippi.

Salpiglossis cactorum, sp. nov., erecta 3–5 dm. alta gracilis; partibus inferioribus villosis, partibus superioribus stipitato-glanduliferis; caulibus pluribus teretibus basem versus suffruticosis caudicem humilem laxem formantibus supra basem laxe ramosis; foliis alternis ciliatis, inferioribus oblanceolatis pinnatifidis 2–4 cm. longis 10–13 mm. latis villosis superioribus gradatim transmutatis, summis linearibus integerrimis glabratis vel sparse glandulosis 1–2 cm. longis ca. 1 mm. latis; pedicellis 1–2 cm. longis laxe ascendentibus glanduliferis; calyce 2–3 mm. longo glandulifero nigro-costato, dentibus inaequalibus erectis 0.7–1 mm. longis; corolla violacea 12–15 mm.

longa extus glaberrima vel rare sparsissime glandulifera intus glaberrima tubo 3–4 mm. longo gracili calycem superanti faucibus anguste oblique infundibuliformibus 4–5 mm. longis paullo ventricosis limbo obliquo cum venis purpureo-marginatis reticulato labia superiori trilobata, lobo supremo longissimo et latissimo elliptico recto ca. 4–5 mm. longo 3–3.5 mm. lato apice rotundato, lobis lateralibus et inferioribus oblongis ca. 3 mm. longis; staminibus 4 didynamis inclusis ad 5 mm. supra basem corollae affixis, inferioribus longioribus ad 3.5 mm. longis, superioribus ca. 3 mm. longis geniculatis, antheris quam illis in filamentis longioribus triplo majoribus; stigmate illo *S. chilensis* simili; capsula calyce persistente vestita subglobosa ca. 3 mm. longa; seminibus fuscis numerosis alveolatis.—CHILE: rocky hillside near Aguada del Cardon, Dept. Taltal, Nov. 30, 1925, *Johnston 5258* (TYPE, Gray Herb.).

This species is related to *S. chilensis* but differs in having flowers over twice as large and vegetative parts more pubescent and glandular. The lobes of the leaves, as in *S. brachysiphon* from Tocopilla, are broad, toothed or irregularly lobed and divaricate and hence differ from the longer, ascending, narrow, practically entire lobes of *S. chilensis*. In addition, the habit of the plant is much less freely branched.

Schizanthus lacteus Ph. Fl. Atac. 45 and Viage Des. Atac. 20, 219 (1860). *S. San Romani* Ph. Anal. Univ. Chile xci. 126 (1895).

An annual herb growing in dryish gravel. It has been collected near Taltal (*Borchers, Werdermann 788, J. 5083*), Hueso Parado (*Philippi*, type of *S. lacteus*), Cascabeles (*J. 5175*), Queb. Guanillo near Paposo (*J. 5576, 5577*), above El Rincon near Paposo (*J. 5480*), and Paposo (*San Roman*, type of *S. San Romani*). The typical form of the species has white corollas. San Roman's collection from near Paposo has violet flowers and was made the type of *S. San Romani* Ph. I collected this colored form at El Rincon (*J. 5480*) and in Queb. Guanillo (*J. 5577*). At the latter station it grew with the white-flowered form and, except for flower color, was indistinguishable. The typical form also grows at Antofagasta.

Schizanthus laetus Ph. Fl. Atac. 45 and Viage Des. Atac. 16, 20, 26, 219 (1860).

A handsome species, reminiscent of *S. pinnatus* R. & P., which occurs in moist situations along the border of the fertile belt. It is restricted to our area and has been collected only at Cachinal de la Costa (*Philippi*, type), Taltal (*Werdermann 817*), Cachinalcito (*J. 5207*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5341*).

SCROPHULARIACEAE

Calceolaria bipinnatifida Ph. Fl. Atac. 46 and Viage Des. Atac. 26, 220 (1860).

Abundant locally along the streamlet of fresh water at Ag. Panul (*J. 5420*) where it becomes 6–12 dm. tall and together with *Parietaria* it forms a lush tangle of stems that completely covers the water. The flowers are sulphur yellow. In labeling and describing this plant Philippi indicated its source as Miguel Diaz. However, in his Viage, pg. 26, he definitely states that his material came from Ag. Panul, a locality which he visited and at which he could scarcely have missed this plant. On the authority of Dr. F. W. Pennell, who is studying *Calceolaria* and who has studied the Peruvian relatives of this species in the field, I am recognizing Philippi's species as distinct from *C. pinnata* L. under which it has been treated by Reiche and by Kränzlin.

Calceolaria paposana Ph. Fl. Atac. 46 and Viage Des. Atac. 26, 220 (1860).

A weak shrub, 3–9 dm. tall, with elongate erect branches terminated by cylindrical thyrses of yellow flowers. The plant seems to prefer cliffs and rocky ledges. It was collected in Queb. San Ramon on a dry cliff but at other stations grew in moist situations in the lower part of the fertile belt. I have seen collections from Taltal (*Werdermann 847*), Queb. San Ramon (*J. 5134*), Punta Grande (*J. 5211*), Paposo (*Philippi*, type), Ag. Panul (*J. 5419*) and Ag. Cardon (*J. 5262*).

Calceolaria Kingi Ph. Anal. Univ. Chile xci. 149 (1895). *C. glutinosa* Meigen, Bot. Jahrb. xvii. 289 (1893), not Heer & Regel (1845). *C. racemosa* of Ph. Fl. Atac. 46 and Viage Des. Atac. 26, 220 (1860).

Growing on moist rich slopes in the fertile belt. It is an herb 1.5–10 dm. tall with the leaves mostly basal. Philippi encountered it near Paposo. I found it on the slopes above El Rincon (*J. 5481*) and in two places near Ag. Miguel Diaz (*J. 5345, 5346*). The determination and synonymy are by Dr. Pennell.

Monttea chilensis Gay, Fl. Chile iv. 417, t. 51 (1849); Ph. Fl. Atac. 36 and Viage Des. Atac. 19, 23, 25, 27, 210 (1860). *M. chilensis*, var. *taltalensis* Reiche, Fl. Chile vi. 65 (1911).

A globose bush 9–12 dm. tall growing on rocky slopes below the fertile belt. In our area it is known only along the coast between Taltal and Miguel Diaz. I have seen collections from Taltal (*Borchers, Werdermann 857*), near Caleta de Hueso Parado (*J. 5174*).

Paposo (*Philippi*), Punta del Rincon near Paposo (*J. 5237*) and Ag, Miguel Diaz (*J. 5344*). Philippi reports it from Hueso Parado, Paposo and Miguel Diaz. Gay illustrated the flowers as violaceous and authors have continued to describe them as so. The plants of *M. chilensis* seen by me in the Dept. of Taltal have the corollas white or greenish outside, the lobes white and slightly purplish at the base, and the throat purplish above within. The texture of the corolla is firm. The leaves are somewhat leathery. Our plants frequently have broad, nearly orbicular leaves. One of these forms is the basis of Reiche's var. *taltalensis*. As plants with leaves quite like those of typical plants from Coquimbo also occur in our area I do not believe the variety worthy of recognition.

Linaria canadensis (L.) Dum.-Cours, var. **texana** (Scheele) Pennell, Proc. Acad. Nat. Sci. Philad. lxxiii. 502 (1922). *L. canadensis* of Philippi, Fl. Atac. 45 and Viage 16, 26, 219 (1860).

This little annual has been collected near Taltal (*Borchers, Werdermann 829*), "Cachinal (Paposo, etc.)" (*Philippi*) and Ag. Cardon (*J. 5263*). My collections have small, apparently cleistogamous flowers with very reduced spur.

Veronica persica Poir. Encyc. viii. 542 (1808).

Locally frequent on grassy slopes in the lower part of the fertile belt above El Rincon (*J. 5486*).

Orthocarpus australis Benth. in DC. Prodr. x. 537 (1846); Ph. Fl. Atac. 45 and Viage 25, 219 (1860).

Reported from Paposo by Philippi. I did not find in the Philippi Herbarium any specimens of this genus from the area.

BIGNONIACEAE

Argylia radiata (L.) Don, Edinb. Philos. Jour. ix. 261 (1823). *A. eremophila* Ph. Linnaea xxxiii. 180 (1864). *A. puberula* of Ph. Fl. Atac. 36 and Viage Des. Atac. 12, 16, 38, 210 (1860).

Frequent on the dunes and in dryish gravel. It has been collected at Barquito (*J. 4816*), Taltal (*Borchers, Werdermann 845*), Breas (*Larrañaga*), Miguel Diaz (*J. 6300*) and "Cachinal, Hueso Parado, etc." (*Philippi*, type of *A. eremophila*). A very variable plant. Feuillée's plant, the basis of *A. radiata* as well as of *A. Feuillei* DC., is given by Gay, Fl. Chile iv. 409 (1849), as from Cobija. This may be correct, although it should be noted that the latitude of the collecting locality given by Feuillée, Jour. Obs. Phys. ii. 731, t. 22 (1714), is about that of Ilo, Peru, at which he is known to have collected.

Argylia sitiens, sp. nov., pumila albo-villosa inconspicue minuteque glandulifera; caule erecto 1–2 cm. longo saepe subterraneo e radice recta gracili succulenta 3–5 mm. crassa 8–15 cm. longa angustissime clavata vel subulata erumpenti supra in ramos plures pauciramosos 1–3 cm. longos prostratos villosulos abrupte decomposito; foliis alternis vel superioribus non rariter suboppositis 0.8-1.6 cm. diametro; petiolis gracilibus villosulis 1–4 cm. longis inferioribus quam superioribus conspicue longioribus; foliolis 9–11 anguste oblanceolatis obtusis paucilobatis vel subintegris subtus dense villosis supra sparse villosis margine plus minusve revolutis intermediis 0.8–1.1 cm. longis; calyce 3 (maturitate 4) mm. longo in lobos lineares acutos erectos villosos partito 0.5–2 vel non rariter ad 3 mm. longe pedicellato; corolla lutea ca. 16 mm. longa sparsissime villosula minute inconspicueque glanduligera, tubo gracili tubuloso 5–6 mm. longo ad 1 mm. diametro, faucibus abrupte dilatatis 4–5 mm. longis ad apicem ca. 5 mm. diametro, limbo 11–12 mm. diametro, lobis latis rotundis ascendentibus; capsula 15–22 mm. longa 2.5–3 mm. lata compressa apice acuminata vel valde acuta basi rotundata, valvis trinerviis sparse villosulis; seminibus griseis 1.5 mm. latis obscure minuteque tuberculatis.—CHILE: high very arid crest above the fertile belt near Aguada Panulcito, Dept. Taltal, Dec. 5, 1925, *Johnston 5467* (TYPE, Gray Herb.).

This plant was one of the few extreme xerophytes found near the upper limit of vegetation on the barren excessively arid ridge-crests above the fertile belt near Ag. Panulcito. It grew in dry decomposed rock and was rare. The plant is related to *A. geranioides* DC., but has a different root and habit, as well as fewer leaflets and a less dense pubescence.

ACANTHACEAE

Dicliptera paposana Ph. Fl. Atac. 40 and Viage Des. Atac. 19, 20, 25, 27, 214 (1860).

A perennial with erect or decumbent stems 3–9 dm. tall. I collected it on a gravelly bank near Agua Perales in Queb. Guanillo near Paposo (*J. 5578*), and on the moist rocky floor of the quebrada at Ag. Miguel Diaz (*J. 5339*). The type and only specimen in the Philippi Herbarium is labeled, "Paposo, Hueso Parado etc." Philippi reported it from Hueso Parado, Paposo and Miguel Diaz. The plant belongs in the fertile belt.

PLANTAGINACEAE

Plantago macrostachys Decne., var. nov., Pilger, in lit.

Covering a wet cliff at Ag. Cachinalcito (*J. 5198*, type). Probably referable to this species is the plant observed in the vega at Ag. Perales near Paposo by Philippi, Fl. Atac. 47 and Viage 23, 26, 221 (1860), and reported as being doubtfully *P. Candollei* Rap.

Plantago sp. nov., Pilger, in lit.

This very distinctive plant was seen only in the steep gulch directly above the water-hole at Ag. Panul (*J. 5444*, type). It was locally common growing in the open in moist, very coarse rocky gravel. It is an obvious perennial and in age develops an erect, loosely branched suffruticose caudex.

Plantago litorea Ph. Fl. Atac. 46 and Viage Des. Atac. 20, 220 (1860). *P. litoralis* Ph. Viage Des. Atac. 26 (1860).

A slender annual herb growing on the gravelly floor of the quebrada south of Ag. Cachina (*J. 5746*), at ca. 200 m. alt. near Taltal (*Werdermann 807*) and on the dunes below Ag. Miguel Diaz (*J. 5298*).

Plantago deserticola Ph. Fl. Atac. 46 and Viage Des. Atac. 20, 220 (1860). *P. desertorum* Ph. ex Johnston, Rev. Chile Hist. Nat. xxx. 15 (1926), lapsu calami. *P. brachyantha* Ph. Fl. Atac. 47 and Viage Des. Atac. 20, 221 (1860). *P. deserticola*, var. *brachyantha* Johnston, l. c. 16.

This slender annual grows in gravelly or sandy places and is known only from our area. I have seen collections from Cachinal de la Costa (*Philippi*, type of *P. brachyantha*), near Ag. Cachinal (*J. 5713, 5747*), Hueso Parado (*Philippi*, type of *P. deserticola*), between Queb. Anchuña and Estancia Vieja (*J. 5199*), Paposo (*Philippi*), Punta Grande (*J. 5223*), El Rincon (*J. 5526*), Ag. Panulcito (*J. 5469*) and Ag. Cardon (*J. 5283*). The specimens from Hueso Parado, Paposo and El Rincon are less silky, have slightly larger corolla-lobes and seeds that are a little larger and duller than in the other specimens mentioned. These three are typical *P. deserticola.* The other collections are referable to the var. *brachyantha.* Dr. Pilger considers the species and variety as indistinguishable from *P. rancaguae* Steud., and has so determined all my collections. *Plantago rancaguae* seems to me to be more closely related to *P. hispidula* R. & P. and to differ from our plants in the longer corolla-lobes and the more elongate capsule. Furthermore *P. deserticola* comes from a very detached natural area nearly 500 km. north of the region in which *P. rancaguae* has been reported to grow.

RUBIACEAE

Cruckshanksia hymenodon H. & A. Bot. Miscl. iii. 361 (1833).

A prostrate white-tomentose perennial infrequent in dry stream-

ways below the fertile belt near Barquito (*J. 4818*). The corolla is yellow and the foliaceous sepals white.

Cruckshanksia pumila Clos in Gay, Fl. Chile iii. 196, t. 33 (1847). *C. tripartita* Ph. Fl. Atac. 26 and Viage Des. Atac. 12, 13, 17, 38, 200 (1860). *C. Darapskyana* Ph. Anal. Univ. Chile lxxxv. 738 (1894).

Frequent in dryish gravel outside the fertile belt. It is a prostrate herb with yellow corollas and sepals. In our area the plant is annual or only rarely perennial and does not develop distinctly shrubby stems as does *C. Montiana* Gay, a more southerly ranging form which is distinguished from *C. pumila* only by its habit. *Cruckshanksia pumila* has been collected in our region at Barquito (*J. 4784*), Pan de Azucar (*Philippi*, type of *C. tripartita*), Ag. Cachina (*J. 5711*), Taltal (*Darapsky*, type of *C. Darapskyana; Werdermann 810; J. 5106, 5160*), Paposo (*J. 5595, 5560*) and Punta Reyes near Miguel Diaz (*J. 5301*). Probably also synonymous with *C. pumila* are *C. chrysantha* Ph., and *C. Geisseana* Ph.

Galium diffusum Clos in Gay, Fl. Chile iii. 180 (1847).

Forming prostrate mats about rocks in the upper part of the quebrada above Agua Lora on the southeast slope of Cerro Perales near Taltal (*J. 5621*). Material collected by Darapsky in Queb. Loritas near Taltal is the same.

Galium Aparine L. Sp. Pl. 108 (1753).

Collected by Werdermann (no. *863*) at ca. 500 m. alt. near Taltal.

Relbunium hypocarpium (L.) Hemsl. Biol. Cent.-Amer. ii. 63 (1881).

Prostrate or scrambling through brush on a moist ridge in the fertile belt near Ag. Miguel Diaz (*J. 5302*).

Relbunium hirsutum (R. & P.) Schum. in Mart. Fl. Bras. vi. pt. 6, 116 (1888).

I somewhat doutbfully refer here a plant collected in gravelly clearings in the fertile belt above El Rincon (*J. 5525*). It forms dense prostrate mats 1–2 dm. broad and in habit and distribution of pubescence is very much like *R. hirsutum*.

VALERIANACEAE

Valeriana pubescens Ph. Fl. Atac. 26 and Viage Des. Atac. 19, 25, 200 (1860).

Growing on cliffs in the fertile belt. I have seen material from near Barquito (*J. 4819*), from sea-cliffs near Ag. Cachina (*J. 5712*), near Taltal (*Borchers; J. 5105*); and Hueso Parado (*Philippi*, type). Philippi reports it from Paposo.

Valeriana integrifolia Ph. Anal. Univ. Chile lxxxv. 742 (1894).

This species, the type of which came from Punta del Morro near Caldera, can now be reported from 500 m. alt. in the hills near Taltal (*Werdermann 846*) and from ledges on the moist slopes in the fertile belt near Ag. Miguel Diaz (*J. 5300*). The plant is very variable in leaf-outline, varying from entire to pinnately lobed on a single stem.

CUCURBITACEAE

Sicyos bryoniaefolius Moris, Mem. Accad. Torino xxxvii. 106, t. 6 (1831). *S. Badaroa* H. & A.; Ph. Fl. Atac. 18 and Viage Des. Atac. 19, 25, 27, 192 (1860).

Trailing over rocks and shrubs along the lower edge of the fertile belt. It is not common. Philippi reports it from Hueso Parado, Paposo and Miguel Diaz. I collected it near Taltal (*J. 5125*) and at Ag. Miguel Diaz (*J. 5303*).

CAMPANULACEAE

Specularia perfoliata A. DC. Monog. Camp. 351 (1830); Ph. Fl. Atac. 35 and Viage Des. Atac. 25, 209 (1860).

Collected in the fertile belt near Paposo by Philippi.

COMPOSITAE

Ophryosporus triangularis Meyen, Reise i. 402 (1834). *Eupatorium foliolosum* DC.; Ph. Fl. Atac. 29 and Viage Des. Atac. 27, 203 (1860).

A common bush growing on slopes and in gravel of stream-ways, both in and out of the fertile belt. It is commonly 1–1.5 m. tall but rarely, supported by other shrubs, it attains 2.5 m. in height. The leafy branches are elongate, subsimple and quite erect. In the common form the pappus and tegules are brownish. Frequently I found associating with this form, however, a phase with greenish tegules and pale pappus. The species grows occasionally in the dry interior and develops there a xerophytic phase characterized by shortened branches and excessively crowded leaves. My collection from Posada Hidalgo, one of these xerophytes, has the leaves congested to form a dense cylinder of foliage a little over a centimeter in diameter. The species has been collected at Barquito (*J. 4809*), Ag. Grande (*J. 5758*), Posada Hidalgo (*J. 5661*), Taltal (*J. 5080, 5165*), Ag. Cachinalcito (*J. 5173*), El Rincon (*J. 5483*) and Ag. Panul (*J. 5426, 5427*).

Ophryosporus Johnstonii Robinson, Contr. Gray Herb. lxxvii. 4 (1926).

A compact intricately branched usually globose bush ca. 1 m. tall which grows in rocky ground. It was seen at only three places. On the gravelly alluvial plain just below Ag. Panul (*J. 5424*, type) it is very common along the dry gravelly stream-channels, where it grows with *O. triangularis*. At Ag. Cardon (*J. 5259*) and Ag. Miguel Diaz (*J. 5310*) it grows on rocky slopes in the quebradas. It occurred in moist situations only at Ag. Miguel Diaz.

Eupatorium Remyanum Ph. Fl. Atac. 29 and Viage Des. Atac. 203 (1860).

The type of this species was collected at Miguel Diaz by Philippi. The plant is apparently a rare one for I observed it only once, that in a moist rich hillside gully in the fertile belt on the slopes above El Rincon (*J. 5484*). This collection and a photograph of the type have been studied by Prof. Robinson who reports upon them as follows:

"In separating this plant of northern Chile from the common *E. glechonophyllum* Less., which ranges from Coquimbo to Conception, Philippi laid stress chiefly upon the broader and less attenuate leaves and expressed the suspicion that it might be only a variety. Reiche, Fl. Chile iii. 265 (1902), reduces without question *E. Remyanum* to *E. glechonophyllum*, pronouncing it merely a shorter- and broader-leaved form. However, the material collected at El Rincon, which closely matches the type of *E. Remyanum*, not only confirms the differences of leaf-contour mentioned by Philippi but yields further characters which go far to prove the distinctness of the species. The stems, or rather the upright branches from the strongly decumbent or even prostrate base are taller and more virgate than in *E. glechonophyllum* and have much longer internodes and consequently less clustered foliage, the heads are slightly larger and the under surface of the leaves, which in *E. glechonophyllum* is rather pale, is in *E. Remyanum* a vivid green. Finally if the areoles between the veinlets on the lower surface of the leaves (in the dried specimens) be examined with a lens they are found in *E. glechonophyllum* to be flat or nearly so, while in *E. Remyanum* they are curiously wrinkled. Although this is a post mortem trait it seems to be of some real diagnostic worth since it indicates an inherent difference of leaf-texture, that of *E. Remyanum* probably being more fleshy and therefore subject to greater contraction in drying."

Stevia hyssopifolia Ph. Fl. Atac. 29 and Viage Des. Atac. 25, 203 (1860). *S. menthaefolia* Ph. Fl. Atac. 29 and Viage Des. Atac. 15, 19, 203 (1860), not Sch.-Bip. (1852). *S. Philippiana* Hieron., Bot. Jahrb. xl. 364 (1908).

A perennial with erect tufted stems 1–10 dm. tall. It has been

collected near Cachinal de la Costa (*Philippi*, type of *S. menthaefolia*), on a dryish cliff in quebrada above Ag. Grande (*J. 5760*), about the head of the foggy sea-cliffs near Ag. Grande (*J. 5759*) and Ag. Cachina (*J. 5691*), at Hueso Parado (*Philippi*, type of *S. hyssopifolia*), on a dryish rocky hillside at the southwest base of Cerro Perales along the trail between Ag. Lora and Caleta de Hueso Parado (*J. 5606*) and on slopes in the fertile belt at El Rincon (*J. 5485*). Philippi also reports it from Paposo although no collections from that locality are extant. The two collections he did make, the types of his two species, represent extremes in leaf-variation. The material that has been collected from south of Taltal Valley has elliptical or lance-oblong leaves. The type of *S. hyssopifolia* and my collections from Cerro Perales, from more arid habitats, have linear leaves. The collection from El Rincon, however, seems to be intermediate in leaf-form, varying greatly in this regard on stems in the same colony and even in the foliage of a single stem. Floral distinctions between the forms do not appear to exist. Perceptible variation also occurs in the firmness of leaf-texture, prominence of veins, abundance or almost complete lack of villous pubescence in addition to the always present glandular puberulence, and finally in the degree to which the cauline leaves are reduced on the upper parts of the stem. Prof. Robinson, who has studied my material, has been unable to correlate these variations either with each other or even with geographical distribution. A collection from Ag. Panul, however, shows perceptible differences in its tegules and achenes which seems to warrant the recognition of a variety distinguished as follows:

Stevia hyssopifolia Ph., var. **panulensis** Robinson, var. nov., involucri squamis sparse cum glandulis subsessilibus munitis et cum pilis albis attenuatis eglandulosis etiam ornatis conspicue cum pilis eglandulosis ciliatis; achaeniis ad apicem versus subpatenter hispidulis.—CHILE: on a moist place on the granitic cliff by the waterhole at Aguada del Panul, Dept. Taltal, Dec. 4, 1915, *Johnston 5425* (TYPE, Gray Herb.).

In typical *S. hyssopifolia* the bracts of the involucre have a short glandular puberulence and very few if any non-glandular hairs, while the margin is shortly and often obscurely glandular-ciliolate. The achenes are shortly appressed-strigillose. In gross habit and in its narrow leaves the type collection of this variety is very similar to the material of the typical *S. hyssopifolia* collected at Hueso Parado and at Cerro Perales.

Aplopappus rosulatus Hall, Carnegie Inst. Pub. no. 389, pg. 329, fig. 113 (1928).

A prostrate shrub growing on the moist gravelly flats at the crest of the foggy sea-cliffs near Ag. Grande (*J. 5815*, type) where only three colonies were seen.

Aplopappus deserticola Ph. Anal. Univ. Chile lxxxvii. 592 (1894); Hall, Carnegie Inst. Pub. no. 389, pg. 349 (1928). *A. involucratus* Ph. l. c. 593. *A. Rengifoanus* of Ph. Fl. Atac. 30 and Viage Des. Atac. 15, 204 (1860).

An irregular and sparsely branched shrub 3–15 dm. tall which grows in dry rocky soil or on rock-outcrops outside of the fertile belt. It is known only from our area where it has been collected at Cachinal de la Costa (*Philippi*, type of *A. involucratus*), Ag. Grande (*J. 5752*), Breas (*Larrañaga*, type of *A. deserticola*), Queb. San Ramon (*J. 5151*), Agua Perales near Paposo (*J. 5603*), Ag. Cardon (*J. 5287*) and Ag. Miguel Diaz (*J. 5332*).

Gutierrezia taltalensis Ph. Anal. Univ. Chile lxxxvii. 426 (1894).

Confessing my inability to place satisfactorily the northern Chilean forms of this genus without its revision as a whole, I am referring them to *G. taltalensis*. This species is based upon specimens of a plant, apparently in off bloom, which were collected by Borchers near Taltal. Our plant forms a small bush 3–13 dm. tall and grows in dry rocky places outside of the fertile belt and frequently at some distance back from the coast. It is usually white-flowered but four (*J. 5331, 5472, 5533, 5723*) of my eleven collections have yellow flowers. The foliage varies in shape and size, and the heads vary in amount of glandularity and in the degree of crowding. I have seen the following collections: Ag. Grande (*J. 5751*), Cerro de la Cachina (*J. 5722*), Ag. Cachina (*J. 5723*), Posada Hidalgos (*J. 5665*), Ag. Mantos (*J. 5658*), Taltal (*Borchers*, type; *J. 5112*), Breas (*Larrañaga*), Queb. San Ramon (*J. 5150*), Cerro Perales (*J. 5625*), El Rincon (*J. 5533*), Ag. Panulcito (*J. 5472*), and Ag. Miguel Diaz (*J. 5331*). Borcher's and Larrañaga's collections are apparently the white-flowered form.

Erigeron paposanum Ph. Fl. Atac. 29 and Viage Des. Atac. 25, 203 (1860).

An herb 5–12 dm. tall which is suffruticose below and springs from a definitely perennial base. It grows on the moist slopes in the fertile belt where it is infrequent. The rays are white or cream-colored and usually surpass the disk florets by 0.5–1 mm. The achenes are strongly compressed and have somewhat thickened margins and strigose faces. It is known only from north of Paposo whence I have seen collections from Paposo (*Philippi*, type), El Rincon (*J. 5532*), Ag. Panul (*J. 5443*), Ag. Cardon (*J. 5286*) and Ag. Miguel Diaz (*J. 5330*).

Baccharis taltalensis, sp. nov., glaberrima fruticosa 6–15 dm. alta subglobosa ramosissima; ramis vetustioribus subgriseis evidenter cicatricosis, junioribus 2–10 cm. longis angulatis dense foliosis glandulosis et saepe subvernicosis, internodiis 1–10 mm. longis; foliis alternis 1–1.5 cm. longis 1–2 mm. latis linearibus vel anguste oblanceolato-linearibus concoloribus crassiusculis integerrimis costatis sed enervatis sparse glandulosis; capitulis 40–50-floris in axillis foliorum ad apices ramorum congestis corymbum terminalem oligocephalum formantibus campanulatis 5–6 mm. longis 3.5–4.5 mm. crassis utrorumque sexum subconformibus; tegulis 3–4-seriatis imbricatis obtusis glanduliferis margine hyalinis et non rariter fimbriatis longitudinaliter medium versus herbaceis brunneis vel purpurascentibus, exterioribus oblongis vel ovatis, interioribus oblongo-linearibus vel oblongo-lanceolatis; setis pappi 5 mm. longis numerosis filiformibus albidis flexuosis; flosculis hermaphroditis ad 5 mm. longis, tubo cylindrico 2.5 mm. longo glanduligero, faucibus late campanulatis ca. 0.5 mm. longis, lobis lanceolatis 2 mm. longis, stylo 5 mm. longo paullo exserto in lobos oblongos crassiusculos ad 1 mm. longos glanduliferos diviso, antheris 2 mm. longis partibus fertilibus 1.3 mm. longis appendicula lanceolato-oblonga 0.6 mm. longa; flosculis pistilliferis graciliter tubuliformibus ca. 3.5 mm. longis extus sparse glanduliferis apice irregulariter inconspicueque dentatis, stylo 5 mm. longo corollam conspicue superante in lobos acutos lineares 1 mm. longos divisis; achaeniis costatis glabris.—CHILE: dry gravelly slopes near Aguada Grande, Dept. Chañaral, Dec. 16, 1925, *Johnston 5750;* dry gravelly slopes on Cerro de la Cachina near Aguada da la Cachina, Dept. Taltal, Dec. 15, 1925, *Johnston 5721;* dry bushy slopes above the fertile belt, El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5531;* arid ridge crests above the fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5329* (TYPE, Gray Herb.).

A dense dark green glandular-resinous subglobose bush usually about a meter tall. It is a decided xerophyte being observed only in localities of pronounced aridity. Near Ag. Miguel Diaz and El Rincon it was confined to the dry crests of the coastal hills above the fertile belt. On Cerro Cachina it grew near the summit on the dry landward slopes away from the fog ladened sea-breezes and at Ag. Grande it grew only on sunny talus slopes in the quebrada beyond the influence of the sea-fog.

The species belongs to Heering's *Eubaccharis* § *Pedicellatae* and is apparently most nearly related to *B. rosmarinifolia* H. & A., from which it is readily separated by having the pistillate and hermaphroditic heads similar in size and form. The pappus in both types of

heads is about 5 mm. long and is not greatly elongated in the pistillate flowers as is the case in *B. rosmarinifolia*. The leaves in *B. taltalensis* are much more slender and less rigid than in its relative. In the character and size of the inflorescence the two species are much alike. The proposed species seems to be a very distinct one and is apparently endemic to our area. I have seen no material, except that cited, which could be possibly referred to it.

Facelia retusa (Lam.) Sch. Bip., var. **chilensis** (F. & M.) Baker ex Beauv. Bull. Soc. Bot. Genève, ser. 2, v. 215 (1913).

Collected at ca. 400 m. alt. near Taltal by Werdermann (no. *801*).

Gnaphalium sphacelatum HBK., var. [?] **chilensis** DC. Prodr. vi. 234 (1837). *G. sphacelatum* in Ph. Fl. Atac. 33 and Viage Des. Atac. 207 (1860).

An erect weedy annual growing on a gravelly bench at the mouth of the quebrada at Ag. Miguel Diaz (*J. 5323*). Philippi reported it from near Paposo. Werdermann (no. *783*) collected it at ca. 500 m. alt. near Taltal. I refer to the var. *chilensis* the indigenous weedy annual *Gnaphalium* related to *G. spathulatum* Lam. and ranging near the coast at least from Valparaiso to Mollendo.

Gnaphalium

A sprawling perennial growing on rich slopes in the fertile belt above El Rincon (*J. 5258*). The plant is closely related to *G. heterotrichum* Ph.

Encelia canescens Lam., var. **tomentosa** (Walp.) Ball, Jour. Linn. Soc. xxii. 160 (1886); Blake, Proc. Am. Acad. Sci. xlix. 370 (1913). *E. tomentosa* Walp.; Ph. Fl. Atac. 34 and Viage Des. Atac. 12, 208 (1860).

A pallid bush 3–10 dm. tall growing on a sandy bench near the sea at Barquito (*J. 4820*). Philippi reported it from Las Animas.

Encelia canescens Lam., var. **lanuginosa**, var. nov., a varietate typica differt lanugine abundantissima molli opaca pervestita.—CHILE: dry shrubby zone above the fertile belt, El Rincon near Paposo, Dept. Taltal, Dec. 7, 1925, *Johnston 5529* (TYPE, Gray Herb.).

This variety differs from the typical form in its very thick cottony tomentum. It was seen only on the dryish rocky slopes towards the crest of the hills above El Rincon. A very similar form has been collected near Breas by Larrañaga.

Bidens triplinervia HBK., var. **macrantha** (Wedd.) Sherff, Bot. Gaz. lxxx. 383 (1925). *B. chilensis* of Ph. Fl. Atac. 34 and Viage Des. Atac. 25, 208 (1860).

A perennial with decumbent or widely ascending slender simple branches. I found a colony on a rocky ridge-crest at the upper edge of

the fertile belt near Ag. Miguel Diaz (*J. 5328*) and another larger colony at Ag. Panul (*J. 5442*) where it was common locally on the moist cliffs and talus just above the water-hole. Philippi collected it near Paposo and reported it incorrectly as *B. chilensis* DC., one of the weedy annual species. The present determination is by Dr. E. E. Sherff.

Perityle Emoryi Torr., var. **elata** (Ph.), comb. nov. *Closia elata* Ph. Fl. Atac. 31 and Viage Des. Atac. 19, 205 (1860). *C. Cotula*, var. *elata* Reiche, Anal. Univ. Chile cxii. 159 (1903) and Fl. Chile iv. 108 (1905). *C. Cotula* Remy in Gay, Fl. Chile iv. 120, t. 46 (1849). *C. chilensis* Regel & Körn. Ind. Sem. Hort. Petrop. 1857: 39 (1858). *C. anthemoides* Ph. Fl. Atac. 31 and Viage Des. Atac. 12, 14, 25, 38, 205 (1860). *C. viridis* Ph. Anal. Univ. Chile lxxxvii. 710 cum fig. (1894). (?) *C. elata*, var. *nana* Ph. Anal. Univ. Chile lxxxvii. 711 (1894).

Growing in dryish gravelly places outside of the fertile belt. This variable herb has been collected in our area near Barquito (*J. 4794*), Ag. Grande (*J. 5790*), Hueso Parado (*Philippi*, type of *C. elata*), Taltal (*Werdermann 796*, *J. 5110*), Ag. Cachinalcito (*J. 5203*) and Ag. Miguel Diaz (*J. 5327*). Philippi reported it from Paposo whence the original material (seeds ?) of *C. chilensis* is said to have been obtained.

Although the genus *Closia* has been universally recognized since its original publication in 1849, I have been quite unable to distinguish it from the genus *Perityle* described by Bentham in 1844. The original species of *Closia*, *C. Cotula*, in fact seems to represent no more than a South American foliar variation of *P. Emoryi* Torr., a variable species of Arizona, Sonora, Baja California, and California. In habit the North and South American plants are identical. The only difference I can detect is that the Chilean plant almost universally has the leaves very deeply lobed or parted; in this regard suggesting the Baja Californian *P. robusta* Rydb. In pubescence, distribution of glands, shape and size of achenes, and florets the plants of the two continents are indistinguishable. The Chilean plant does not appear to develop bristles in the pappus and in this regard resembles the common North American phase of the species that has been called var. *nuda* (Torr.) Gray. Whether all the conspicuously rayed Chilean plants are referable to *P. Emoryi*, var. *elata* I can not say. *Closia villosa* Ph., Anal. Univ. Chile lxxxvii. 712 (1894), described from the cordilleras east of Copiapó, has pappus bristles developed. The material apparently referable to this species, which I collected in the cordilleras near Potrerillos (*J. 3678*, *4740*), does not have bristles and

is somewhat fruticulose as are also the plants collected in the interior by Werdermann (no. *160*, *448*). These plants from the interior also tend to have less lobed leaves. Werdermann's collection from near Vallenar (no. *160*) has the achenes lacking the characteristic ciliate margin and instead provided on the margin with minute incurved hairs. The plants from the interior hence depart in several details from the plant of the coastal area, and I believe that their disposition had best await the time when more material of them is available.

Perityle discoidea (Ph.), comb. nov. *Closia discoidea* Ph. Fl. Atac. 31 and Viage Des. Atac. 205 (1860). *C. pusilla* Ph. l. c. *C. foliosa* Ph. Anal. Univ. Chile lxxxvii. 709 (1894). *C. digitata* Ph. Anal. Univ. Chile lxxxvii. 710 cum fig. (1894). *C. brachypetala* Ph. Anal. Univ. Chile lxxxvii. 711 cum fig. (1894).

This plant may possibly be only a variation of the last mentioned, but appears to warrant recognition because of its smaller size, much reduced ray-florets, very frequent development of pappus-bristles, and less dissected more evenly margined leaf-lobes. In our area it has been collected near Barquito (*J. 4793*), Pan de Azucar (*Philippi*, type of *C. pusilla; J. 5829*), Sierra Esmeralda (*San Roman*, type of *C. foliosa*) and Taltal (*Werdermann 775*). The type of *C. pusilla* was correctly described as developing pappus bristles. In the type of *C. discoidea*, described as having an esetose pappus, I found that the bristles were occasionally developed. No pappus bristles were found in the heads of the type of *C. foliosa*.

Bahia ambrosioides Lag. Gen. et Sp. Pl. Nov. 30 (1816); Ph. Fl. Atac. 33 and Viage Des. Atac. 16, 25, 27, 207 (1860).

A weak shrub 3–10 dm. tall frequent in the fertile belt. It has been collected near Barquito (*J. 4791*), Taltal (*Darapsky, Werdermann 811*), Paposo (*J. 5226*) and Ag. Miguel Diaz (*J. 5326*). The ray florets are white or commonly cream-colored. Philippi reports it from Cachinal de la Costa.

Villanova oppositifolia Lag. Gen. et Sp. Pl. Nov. 31 (1816). *Vazquezia biternata* Ph. Fl. Atac. 31, t. 5a and Viage Des. Atac. 205 (1860).

Collected in the fertile belt on the open grassy ridge-crest back of Punta Grande near Paposo (*J. 5225*). Philippi found it at Paposo "in detritu ad basin montium litoralium."

Amblyopappus pusillus H. & A. Jour. Bot. iii. 321 (1841). *Infantea chilensis* Remy; Ph. Fl. Atac. 34 and Viage Des. Atac. 25, 208 (1860).

This annual frequents gravelly places usually close to the coast. It has been collected in a dry quebrada just south of Ag. Cachina

(*J. 5719*), near Breas (*Larrañaga*), on a steep foggy alluvial fan about *Cereus*-trunks at Ag. Cachinalcito (*J. 5202*) and in gravelly places near Paposo (*Philippi*).

Cephalophora litoralis Ph. Fl. Atac. 34 and Viage Des. Atac. 208 (1860).

An annual herb 5–25 cm. tall which is frequent in dryish gravelly places. It has a strong odor very reminiscent of *Anthemis Cotula* L. The species has been collected at Barquito (*J. 4792*), Sierra Esmeralda (*San Roman*), Taltal (*Werdermann 777, J. 5159*) and near Paposo (*J. 5596*).

Senecio cachinalensis Ph. Fl. Atac. 33 and Viage Des. Atac. 15, 207 (1860). *S. breanus* Ph. Anal. Univ. Chile lxxxviii. 251 (1894). *S. copiapinus* Ph. Anal. Univ. Chile lxxxviii. 253 (1894). *S. Larrañagae* Ph. Anal. Univ. Chile lxxxviii. 269 (1894).

A weak shrub with erect elongate flowering branches 2–12 but usually 3–8 dm. tall. It grows usually in the fertile belt although it also occurs in the dryish area back from the coast. In our area it has been collected near Barquito (*J. 4796*), Cachinal de la Costa (*Philippi*, type of *S. cachinalensis*), Ag. Grande (*J. 5791, 5792*), Ag. Cachina (*J. 5724*), Posada Hidalgos (*J. 5667*), Taltal (*Werdermann 820*), Breas (*San Roman*, type of *S. breanus; Larrañaga*, type of *S. Larrañagae*), Rincon (*J. 5534*), and Ag. Panulcito (*J. 5473*). After my experience with this plant in the field I feel confident the concept, *S. cachinalensis*, had best be enlarged to include a wider variation than admitted by Philippi or by Reiche. A study of the types seems to show that *S. cachinalensis* and *S. breanus* were founded on the thrifty forms of the species while *S. copiapinus* was based on the xerophytic phase. The type of *S. Larrañagae* is a form more or less intermediate between these two extremes.

Senecio Almeidae Ph. Fl. Atac. 33 and Viage Des. Atac. 16, 207 (1860). *S. myriophyllus* Ph. Fl. Atac. 33 and Viage Des. Atac. 12, 207 (1860).

A weak glabrate bush with succulent herbage which grows 1.5–10 dm. tall in dry gravel outside of the fertile belt or in the areas back from the coast. It has been collected at Las Animas (*Philippi*, type of *S. myriophyllus*), Cachinal de la Costa (*Philippi*, type of *S. Almeidae*), Ag. Grande (*J. 5753*), Pique de Jacinto Diaz in the Sierra Esmeralda (*J. 5680*), Posada Hidalgos (*J. 5666*), Taltal (*Werdermann 851*), Queb. San Ramon (*J. 5152*). The type of *S. Almeidae* has remotely lobed leaves as in my no. *5152*, but has large heads (like *J. 5753*) on elongate peduncles. It seems to be a form from a shaded or otherwise sheltered situation.

Senecio paposanus Ph. Fl. Atac. 32 and Viage Des. Atac. 25, 27, 206 (1860).

A pale plant of the fertile belt frequently becoming a weak shrub 5–10 dm. tall. It has been collected only at Paposo (*Philippi*, type), Rincon (*J. 5535*), Ag. Panul (*J. 5445*), Ag. Cardon (*J. 5288*) and (?) Ag. Miguel Diaz (*J. 5333*). The collection from Ag. Miguel Diaz is much more coarse and stiff than any other collection seen but appears to be referable here. *Senecio Philippicus* Regel & Körn., Ind. Sem. Hort. Petrop. 1857: 43 (1858), is probably an earlier synonym of Philippi's species.

Senecio Troncosi Ph. Fl. Atac. 32 and Viage Des. Atac. 12, 206 (1860).

An annual growing on the gravelly floor of a quebrada back of Barquito (*J. 4797*). My material matches almost perfectly Philippi's type from Las Animas.

Senecio leptanthus Ph. Anal. Univ. Chile lxxxviii. 15 (1894).

Common on the gravelly floor of the quebradas near Barquito (*J. 4822*). It has also been collected near Taltal (*Werdermann 825*). Although related to *S. vulgaris* L. this plant seems to be indigenous and readily distinguished from its relative by its leaf-outline.

Centaurea cachinalensis Ph. Fl. Atac. 34 and Viage Des. Atac. 16, 208 (1860).

Forming a loosely branched bush 3–10 dm. tall on fog-bathed cliffs and rocky slopes in the fertile belt. The florets are pink or rosy. The plant is known from Barquito (*J. 4821*), Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5749*), and Ag. Cachina (*J. 5720*).

Centaurea atacamensis (Reiche), comb. nov. *C. floccosa* H. & A., var. *atacamensis* Reiche, Anal. Univ. Chile cxiv. 468 (1904) and Fl. Chile iv. 286 (1905). *C. floccosa* of Ph. Fl. Atac. 34 and Viage Des. Atac. 25, 208 (1860).

I collected this species on a rocky hillside southeast of Taltal (*J. 5111*) and again on a rocky gravelly bench on the coastal plain near El Rincon (*J. 5530*). Philippi collected it near Paposo and Borchers got the type-specimens near Puerto Oliva. The florets are white with the tips rose-colored or rarely entirely white. The species is obviously related to *C. floccosa*, which grows in Coquimbo, but is distinguished by its smaller heads, more slender spreading incon-spicuously grooved stems, and less dense more persistent tomentum.

Centaurea chilensis H. & A., var. **stenolepis** Ph. Anal. Univ. Chile xc. 42 (1895).

A slender shrub 9–12 dm. tall growing in rocky places in the fertile belt near Barquito (*J. 4795*). The florets are white.

Chuquiraga ulicina H. & A., var. **incana** (Ph.), comb nov. *C. incana* Ph. Anal. Univ. Chile lxxxv. 829 (1894). *C. acicularis* of Ph. Fl. Atac. 26 and Viage Des. Atac. 12, 27, 200 (1860).

A dense shrub 3–10 dm. tall which is frequent in dry places outside of the fertile belt. It grows in our area near the sea and also in the more arid country inland. I collected it on seaward slopes near Barquito (*J. 4799*), on a dry open stream-way at Posada Hidalgos (*J. 5669*) and on the arid shrubby crests above the fertile belt at El Rincon (*J. 5538*). Philippi reports it as growing from "Las Animas usque ad El Cobre."

This northern plant has been treated as *C. ulicina*, but that name is the proper one for the plant of Coquimbo passing as *C. acicularis* Don. The northern plant is characterized by its much shorter stouter leaves which are cinereous with a short dense pubescence. This form in its extreme is very different from the more southern typical one, but material from about Copiapó seems to combine so clearly the characters of the two that a varietal status for our plant seems most justifiable.

Gypothamnium pinifolium Ph. Fl. Atac. 27, t. 3c and Viage Des. Atac. 13, 15, 17, 18, 24, 201 (1860). *Plazia pinifolia* Hoffm. ex Reiche, Anal. Univ. Chile cxiv. 736 (1904) and Fl. Chile iv. 301 (1905).

A loosely branched dark-green somewhat resinous xerophytic shrub 3–12 dm. tall, which grows on hillsides or more commonly in the dry gravel of stream-ways in the area outside of the fertile belt. It grows near the shore and in the arid interior. I have seen material from Barquito (*J. 4798*), Cachinal de la Costa (*Philippi*, type), Agua Mantos (*J. 5657*), Breas (*Larrañaga*), Taltal (*Darapsky, Werdermann 1044, J. 5113*), Punta Grande (*J. 5234*) and Queb. Guanillo near Paposo (*J. 5597*). Philippi reports it from Las Animas, Cachinal de la Costa, Cachiyuyal, Taltal and Queb. Guanillo. Reiche, Bot. Jahrb. xlv. 344, 347, fig. 3 (1911), reports it from Queb. Chañaral and from between Taltal and Breas. Nothing further is known concerning the range of this monotype. It occurs only within our area. The corollas are violet or violet-purplish. Hoffmann suggested that this plant should be admitted to *Plazia*. It is obviously related there but its differentiated marginal florets and hairy achenes seem significant enough to warrant maintaining it as a monotypic genus.

Proustia tipia Ph. Fl. Atac. 28 and Viage Des. Atac. 19, 24, 25, 27, 202 (1860).

An infrequent stiff spinescent shrub 5–15 dm. tall growing on rocky slopes along the edges of the fertile belt from Taltal to Miguel Diaz. It has been collected at Breas (*Larrañaga*), Puerto Oliva (*Borchers*),

Hueso Parado (*Philippi*, type), and near Ag. Lora on Cerro Perales near Taltal (*J. 5626*). The plant appears to flower late in the summer for during my visit in the area in November and early December only very immature heads were seen.

Chaetanthera glabrata (DC.) Meigen, Bot. Jahrb. xviii. 456 (1894). *Tylloma glabratum* DC.; Ph. Fl. Atac. 28 and Viage Des. Atac. 14, 18, 19, 202 (1860).

A low spreading glabrous herb which grows outside the fertile belt usually in the gravel of dry stream-ways and rarely also in gravelly soils on hillsides. It has been collected at "Cachinal, Taltal, etc." (*Philippi*), Ag. Grande (*J. 5793*), near Taltal (*Werdermann 826, J. 5115*), in Queb. Guanillo near Ag. Perales (*J. 5598*), and on a dry ridge above the fertile belt near El Rincon (*J. 5536*). At the latter station all the plants were definitely perennial. Although the other collections show a tendency to become perennial for the most part they are clearly annual. The rays are yellow with the lower surface reddish.

Chaetanthera linearis Poepp., var. **taltalensis**, var. nov., a varietate genuina differt capitulis discoideis, foliis et partibus juvenalibus non rariter inconspicue lanuginosis.—CHILE: dry hillsides just back of Caleta de Hueso Parado near Taltal, Dec. 11, 1925, *Johnston 5637* (TYPE, Gray Herb.).

Known only from the region about Taltal where it grows on dry gravelly hillsides or perhaps more commonly in dry gravel of stream-ways. Besides the type I have seen collections from Hueso Parado (*Philippi*), Queb. Taltal (*J. 5114*), Taltal (*Werdermann 815*) and from Queb. de Infieles ca. 18 km. south of Taltal (*J. 5649*). The florets are white. The plant is a very slender annual with ascending stems. Philippi, Viage Des. Atac. 19 (1860), reported the plant from near Taltal as *C. linearis* Poepp.

Polyachyrus virgatus, sp. nov., suffruticosus 6–12 dm. altus; caulibus vetustioribus caudicem laxe ramosum erectum 1–2 dm. altum formantibus; ramis erectis vel ascendentibus simplicibus virgatis brunnescentibus supra medium evanescenter inconspicueque arachnoideis infra medium glaberrimis 3–5 mm. crassis; foliis 6–10 cm. longis 15–30 mm. latis carnosulis supra medium caulis abrupte reductis pinnatopartitis minute albo-punctatis supra glabris subtus inconspicue evanescenterque arachnoideis margine revolutis, lobis vix confertis elongatis saepe evidenter irregulariterque lobulatis divaricatis vel antrorse laxeque ascendentibus apice rotundis; base petioli dilatata paullo indurata 1–2 mm. lata vel vix alata, alis petioli non rariter 5–10 mm. infra basem decurrentibus apud folia medialia

auriculas ad 5 mm. latas amplexicaules formantibus; glomerulis capitulorum 15–18 mm. diametro 3–6 globosis in paniculam brevem vel in racemum congestum subspicatum ad apicem pedunculi elongati nudi dispositis; receptaculo glomeruli globoso lanuginoso; bracteis subulatis vel linearibus 2–3 mm. longis glaberrimis rariter sparsissime glanduligeris; involucris flosculorum 1–2-floris 3–3.5 mm. longis glaberrimis tegulo exteriori paullo brevissime ad basem versus callo saepe prominenti notato; flosculis roseis 8.5 mm. longis tubo (faucibus vix differentiatis) 5 mm. longo extus saepe glandulifero, labia interiori in lobos 2 acutos ligulatos 3.5 mm. longos divisa, labia exteriori ovato-elliptica 3.5 mm. longa apice truncata et tridentata; antheris (partibus fertilibus) 1.5 mm. longis linearibus apice appendicula oblongo-lanceolata 1.5 mm. longa coronatis basi cum caudis subulatis sublaevibus 1.2 mm. longis ornatis; setis pappi 5.5 mm. longis albis plumosis uniseriatis.—CHILE: fog-bathed crests of hills near Barquito, Dept. Chañaral, Oct. 29, 1925, *Johnston 4801;* gravelly benches and rocky hillsides near Aguada Grande, Dept. Chañaral, Dec. 16, 1925, *Johnston 5795* (TYPE, Gray Herb.).

Probably most nearly related to *P. Poeppigii* Kunze, of central Chile, but slightly more pubescent and lacking the very large and conspicuous leaf-bases of that species. The leaf-outline of *P. virgatus* agrees with the outline given by Philippi, Anal. Univ. Chile lxix. 270, fig. 6 (1886), as illustrating the leaf of *P. San Romani* Ph. The present species, however, rarely develops leaf-bases as expanded as that illustrated. From *P. San Romani* the new species also differs by lacking a conspicuous arachnoid pubescence on the upper leaf-surfaces. The plant forms a loose weak bush 5–12 dm. tall and is usually about as broad as tall. The corollas are pink.

Polyachyrus San Romani Ph. Anal. Univ. Chile lxix. 270, fig. 6 (1886).

I refer here a collection from a moist bushy slope in the fertile belt back of Punta Grande near Paposo (*J. 5228*). It is a weak brittle scandent perennial with stems and leaves covered with a canescent, almost silvery, thin arachnoid tomentum. The corollas are dilute pinkish. The leaf-bases are conspicuously auriculate, much more so than in the type, but otherwise the collection agrees very well with the type of *P. San Romani*, which came from an undesignated locality in the Desert of Atacama.

The species is obviously related to *P. calderensis* Ph., and to the very closely related *P. tenuifolius* Ph. and *P. selinoides* Reiche. These three are probably only forms of a single species which differs from *P. San Romani* in having much dissected leaf-lobes and a firmer

pubescence. It should be noted that Philippi, and Reiche, who followed him, have incorrectly applied the name *P. niveus* Lag. ex DC., to forms related to *P. calderensis*. A study of the plate and description of *P. niveus* given by De Candolle, Mém. Comp. 37, t. 15 (1838), shows that the name belongs to the plant of middle-western Peru properly called *P. echinopsoides* (Hook.) DC.

Polyachyrus annuus, sp. nov., herbaceus 1–4.5 dm. altus; caule ad basem versus in ramos plures ascendentes elongatos sparse vel vix ramosos decomposito vel non rariter ad basem versus simplici et ad medium versus sparse ascendenterque ramoso; ramis evanescenter canescenterque arachnoideis vetustate glabratis; foliis herbaceis vix confertis irregulariter lobatis, supra sparse evanescenter arachnoideis vetustate glabratis, subtus pallidis plus minusve arachnoideis, margine revolutis, lobis integris ovatis vel oblongis latis apice rotundis; foliis inferioribus petiolatis, lamina 2–3 cm. lata 4–7 cm. longa in petiolum vix vel anguste alatum 2–6 cm. longum contracta; foliis medialibus 4–8 cm. longis 2–3 cm. latis ad basem versus paullo vel vix contractis sessilibus basi conspicue plene vel semiamplexicaulibus; glomerulis capitulorum 13–15 mm. diametro paucis; receptaculo glomeruli subgloboso albo-arachnoideo; bracteis 3–4 mm. longis lanceolatis glabris; involucris flosculorum 1–2-floris 4–5 mm. longis glabris; tegulo exteriori callo prominenti non rariter notato; flosculis albis vel rosaceis 6 mm. longis, tubo (faucibus vix differentiatis) 3 mm. longo, labia interiori in lobos 2 lineares acutos 3 mm. longis divisa, labia exteriori 3–3.5 mm. longa 1.6–2 mm. lata apice tridentata; antheris (partibus fertilibus) 1.3–1.5 mm. longis linearibus apice appendicula hyalina 1.3–1.5 mm. longa coronatis basi caudis linearibus 1.1 mm. longis ornatis; filamentis 1.4 mm. longis; setis pappi 4 mm. longis.—CHILE: shelter of brush on slopes in fertile belt near Aguada de Miguel Diaz, Dept. Taltal, Dec. 2, 1925, *Johnston 5334;* frequent on a gravelly hillside near Tocopilla, Oct. 18, 1925, *Johnston 3583* (TYPE, Gray Herb.); Quebrada de Huantajaya near Iquique, Dept. Tarapacá, Sept. 1925, *Werdermann 758.*

This species is distinguished from all other members of the genus by its completely herbaceous, distinctly annual habit. The material from Ag. Miguel Diaz differs from the other collections cited in being slightly coarser in all parts and in having pink rather than white florets. The broad thin herbaceous leaves with their coarse lobing and the lack of glands on the plant allow *P. annuus* to be readily separated from the annual (probably juvenal) forms I have placed under *P. roseus*.

Polyachyrus fuscus (Meyen) Walp. Nov. Act. Acad. Caes. Leop.

Nat. Cur. xix. suppl. 1, 288 (1843). *Diaphoranthus fuscus* Meyen, Reise i. 406 (1834).

Very common on the sandy lower slopes of the hills near the sea at Barquito (*J. 4800*) where it forms domed rather succulent dull green masses 1.5–6 dm. broad and ca. 3 dm. tall. The leaves are succulent and somewhat crisped. The corollas are pink. My collections from Barquito are quite similar to plants collected about Caldera (*Werdermann 380; J. 5058*). The type of *P. fuscus* was obtained by Meyen near Mina del Checo at ca. 1200 m. alt. in a quebrada east of Tierra Amarilla. It is described as succulent and as glandular throughout. Because of these characters I follow Philippi and Reiche and refer this very glandular and succulent coastal plant to Meyen's species.

Polyachyrus roseus Ph. Fl. Atac. 28 and Viage Des. Atac. 12, 202 (1860). *P. fuscus*, var. *roseus* Reiche Anal. Univ. Chile cxv. 352 (1904) and Fl. Chile iv. 371 (1905).

I associate here a variable assemblage of plants which differ from what I have called *P. fuscus* in being less glandular and in having the lower surface of the leaves clean and white rather than sordid with a brown tomentum. The plants grow in gravelly stream-ways usually back from the shore. The common form is represented by material from Ag. Grande (*J. 5797*), Breas (*Larrañaga*), Ag. Cardon (*J. 5289*) and Ag. Miguel Diaz (*J. 5335*). These are low shrubs with the stems arachnoid above and usually (except in no. *5335* which is glabrous) glandular towards the base. The leaves are glandular above and white-tomentose beneath. At Ag. Grande (*J. 5796*) and Ag. Cachina (*J. 5726*), growing with the form just mentioned, I found a form differing in having the stems and leaves conspicuously white-tomentose and very sparsely if at all glandular. As some intermediate forms were noted I believe this excessively tomentose plant to be worthy only of a formal name if taxonomic recognition is really desirable.

Perhaps distinct, are annual perhaps juvenal plants collected in Queb. San Ramon (*J. 5154*) and near Antofagasta (*J. 3656*). These have slightly larger leaves, somewhat firmer petioles, and the callous on the tegules less developed. The material from Queb. San Ramon has the peduncles as well as the stems glandular and not arachnoid. The type of *P. roseus* from Las Animas (*Philippi*), while agreeing with the common shrubby form in habit, also has the stems glandular and, except for the white-tomentose under-surfaces of the leaves, is very like *P. fuscus*.

Leucheria modesta (Ph.) Reiche, Anal. Univ. Chile cxvi. 192

(1905) and Fl. Chile iv. 415 (1905). *Chabraea modesta* Ph. Fl. Atac. 28 and Viage Des. Atac. 15, 27, 202 (1860). *L. debilis* Ph. Anal. Univ. Chile lxxxvii. 107 (1894).

A weak annual herb growing in the fertile belt under bushes or in the shelter of rocks. It has been collected near Barquito (*J. 4823*), Cachinal de la Costa (*Philippi*, type of *C. modesta*), Breas (*Larrañaga*, type of *L. debilis*), Taltal (*Werdermann 808*), Punta Grande (*J. 5227*) and Ag. Miguel Diaz (*J. 5322*). The florets are white. The lower leaf-surface varies from conspicuously floccose to glabrate.

Oxyphyllum ulicinum Ph. Fl. Atac. 28, t. 4a and Viage Des. Atac. 15, 25, 202 (1860).

A stiff loosely branched usually globose bush 1–2 m. tall which grows in dry gravelly soils and is infrequent though often locally abundant. I have seen material from Cachinal de la Costa (*Philippi*, type), Ag. Grande (*J. 5794*), Ag. Cachina (*J. 5725*), Posada Hidalgos (*J. 5668*), Breas (*Larrañaga*), Queb. San Ramon (*J. 5153*), El Rincon (*J. 5537*). The plant does not grow near the ocean but only in the more arid localities back of the hills facing the shore. The collection from El Rincon came from the arid scrubby slopes well above the fertile belt. Philippi reports the species from Paposo but doubtlessly he collected it in the dryer upper parts of Queb. Guanillo near there. The species is known only from our area and from the stations mentioned. The leaves are rigid with the lobes pungently tipped. The corollas are pinkish to nearly white and hence in color contrast strongly with the purplish protruding anthers.

Hypochaeris grandidentata (Ph.) Reiche, Anal. Univ. Chile cxvi. 601 (1905) and Fl. Chile v. 27 (1910). *Achyrophorus grandidentatus* Ph. Fl. Atac. 29 and Viage Des. Atac. 12, 203 (1860). *A. foliosus* Ph. Fl. Atac. 29 and Viage Des. Atac. 16, 25, 203 (1860). *H. foliosa* Reiche, Anal. Univ. Chile cxvi. 602 (1905) and Fl. Chile v. 28 (1910). *H. deserticola* Ph. Anal. Univ. Chile lxxxvii. 318 (1894). *H. sagittata* Ph. Anal. Univ. Chile lxxxvii. 319 (1894).

I refer here an excessively variable group of forms ranging from the Caldera region northward into our area. Some of these were placed by Reiche in *H. scorzonerae* F. Muell., a species of central Chile. Because I have not had an extended suite of Mueller's species for comparison I prefer to treat our northern plant as distinct, particularly so as it has a detached natural range. I have seen collections from Las Animas (*Philippi*, type of *A. grandidentatus*), Barquito (*J. 4790*), Ag. Grande (*J. 5789*), Cachinal de la Costa (*Philippi*, type of *A. foliosus*), Taltal (*J. 5108, 5109*), Breas (*Larrañaga*, type of *H. sagittata*), Paposo (*Philippi*) and Ag. Miguel Diaz (*J. 5324, 5325*).

Probably also referable here as a pronounced form is a collection from the sea-cliffs near Ag. Cachina (*J. 5718*). This plant has pinnate leaves with the lobes distant, divaricate and ovate.

Malacothrix Clevelandi Gray, Bot. Calif. i. 443 (1876). *Crepis Geisseana* Ph. Anal. Univ. Chile lxxxvii. 328 (1894). *M. senecioides* Reiche, Anal. Univ. Chile cxvii. 192 (1905) and Fl. Chile v. 36 (1910).

An infrequent annual herb on the dryish gravelly floor of the quebrada near Barquito (*J. 4789*). This species, which is infrequent from Coquimbo to Barquito, also occurs in California, Arizona and northern Baja California. The close agreement in all technical details between the material from Chile and the United States is remarkable.

Sonchus asper (L.) Hill, Herb. Brit. 47 (1769); Ph. Fl. Atac. 29 and Viage Des. Atac. 27, 203 (1860).

Philippi reports this species from Miguel Diaz.

Sonchus tenerrimus L. Sp. Pl. 794 (1753). *S. rivularis* Ph. Linnaea xxx. 194 (1859). *S. tenuifolius* Nutt. Trans. Am. Philos. Soc. vii. 438 (1841).

A few plants of this species were observed on a moist ledge on a cliff in Queb. San Ramon near Taltal (*J. 5149*). The plants are annual and appeared to be indigenous. In Chile the species has been collected only at Santiago, Carrizal Bajo, Taltal and Tocopilla. Philippi described the Santiago collection as *S. rivularis* in 1859. He gave the source of the type as "In glareosis fluminis *Mapocho* prope Santiago inveni." The only collection in his herbarium that could possibly be the type is labeled as collected in Nov. 1858 on "Cerro S. Cristobal." Since the Rio Mapocho flows along the southeast base of Cerro de San Cristobal the discrepancy in data is not great.

The species also occurs on the Pacific Coast of North America, where it was first found at San Diego, California, in 1836 by Thomas Nuttall, who considered it native and subsequently described it as *S. tenuifolius* Nutt. The species is best known, however, on the various islands off the coast of California and Baja California, where it is said to seem native and where the chances for widespread introduction are much less than on the adjacent mainland.

The Californian and Chilean plants are quite indistinguishable, so that Nuttall's name must be taken up if this American plant is to be particularly named. Although the species in its occurrence and distribution acts as a native plant in California and Chile I can not find characters to separate it from the distinctive *S. tenerrimus* of southern Europe. It is of course possible that the plant is indigenous on the Pacific Coast and that its presence there is another indication of a

Mediterranean element in the flora. Certainly its occurrence as a native in California and Chile is no more surprising than the presence of *Fagonia chilensis* H. & A., a species doubtfully separable from the Mediterranean *F. cretica* L.

2. The Flora of the Nitrate Coast

The coast of northern Chile, with the possible exception of that of northern Peru, is the driest in America. This paper is concerned with the flora of the most arid section of this very dry region, comprising about 400 odd kilometers of Chilean littoral between lat. 20° and 24° S. On this section of coast are situated the principal nitrate ports, Antofagasta, Tocopilla and Iquique.

Viewed from the passing steamer the region consists of a wall of grayish-brown hills rising abruptly from the narrow coastal plain to about 1000, or here and there to 1500 m. alt., and extending in a line almost north and south. Only near Antofagasta is the regularity of the coast-line broken by a prominent headland. Almost at the crest of the coastal hills begins the great desert tract of flat or rolling country that stretches eastward for nearly 100 km. It is on this elevated, quite barren desert that the nitrates are obtained. The slopes of the hills facing the sea appear to be also quite barren of vegetation, an impression indeed, which is not at once dispelled even when one lands and in the port gazes at them from a much closer range. In ordinary years the slopes nearby are quite bare and utterly devoid even of lichens. The vegetation of the region is confined to certain higher slopes where the moisture from fog-clouds, which frequently drift against them, is sufficient for the development of a meager flora in this otherwise completely desert region.

Within the area the most complete meterological observations have been made at Iquique. Twenty-five years of observation there, Anuario Estadístico i. 4 (1927), show the average temperature for the year to be 18.5° C., the average for January (midsummer) being 21.4° C., and that for July (midwinter) being 11.4° C. The lowest temperature recorded is 10° C. and the highest is 30.9° C. Franze, Peterm. Mitt., Erg. Heft no. 193: 68 (1927), reports that the latest figures, covering a period of twenty-four years, show that the average annual rainfall at Iquique is only 2 mm. Writing nine years ago Jefferson, Am. Geogr. Soc. Research Ser. vii. 1 (1921), described the precipitation at Iquique as follows, "Of the last twenty years fourteen have had no drop of water from the sky. The whole catch of the twenty years has been 28 millimeters (a little over an inch)." The tables given below are adapted from the Anuario Estadístico for

1920–1926 (all available) and show the distribution and character of the rainfall at Iquique and Antofagasta for the seven years through 1925. The years given seem to represent a wet cycle (!) and include among them the phenomenally rainy one of 1925. Nevertheless, the meagerness of precipitation is remarkable. It is to be noticed that most of the total rainfall each year results from one relatively large shower.

Annual Records of Precipitation

Iquique (alt. 9 m.)

Year	Total mm.	Maximum in one day mm.	Date of maximum	Number of days with 0.1 mm. or more	Number of days with 1.0 mm. or more
1925	7.8	2.3	8–21 viii; 27 ix; 1 viii	4	4
1924	0.5	0.3	14 iv	2	0
1923	1.6	1.6	25 v	1	1
1922	1.5	1.5	6 viii	1	1
1921	2.8	2.6	—	2	1
1920	3.0	2.8	2 x	2	1
1919	0	0	—	0	0

Antofagasta (alt. 94 m.)

Year	Total mm.	Maximum in one day mm.	Date of maximum	Number of days with 0.1 mm. or more	Number of days with 1.0 mm. or more
1925	28.8	16.3	3 vii	7	3
1924	7.3	6.8	11 ix	2	1
1923	0.7	0.5	28 xi	2	0
1922	1.5	0.3	—	5	0
1921	0.5	0.5	11 ix	1	0
1920	6.2	6.2	1 x	1	1
1919	0	0	—	0	0

Along most of the coast of Peru and much of northern Chile there is a conspicuous relation between sea-fogs and vegetation. Drifting in from the ocean, particularly during the winter, these wet fogs mantle certain slopes and by their condensation there as mists supplement the scanty rainfall sufficiently to develop a vegetation. This, because of its relative luxuriance, stands out from that on the less favored slopes and forms a distinct green belt. Weberbauer, Engler & Drude, Veg. Erde xii. 134–149 (1911), has described this type of vegetation as found in Peru and has indicated it as constituting a Loma Zone or Loma Formation. The Loma Formation is well developed in southern Peru and just south of our area, in Chile, between Miguel Diaz and Paposo. Along the Nitrate Coast, however, the formation is not luxuriant though it is of particular interest because of the simplicity of the factors directly permitting its develop-

ment. The relation of fog to the presence of vegetation is here most obvious.

In our area there is no continuous band of fertile slopes. These vary in size and in the moisture they receive and are scattered in occurrence. Only here and there along the coast are meterological and topographical conditions right for the formation and the banking of fog and so consequently for the development of some vegetation. Because of the meagerness of the flora, its disrupted occurrence and the difficulties and danger (from lack of water) of traveling along the coast, no one has ever attempted to make a thorough general collection or study the detailed distribution of the plants in the area. Consequently we know the flora only as it is represented on the slopes about the ports of Antofagasta, Cobija (now deserted), Tocopilla and Iquique. Fortunately, however, there is a means of estimating the general extent and development of the vegetation along the coast. Growing on and confined to the fog-moistened slopes on the Nitrate Coast is the large columnar cactus, *Cereus iquiquensis*. This plant grows 2–3 m. tall and is sometimes used as a source of fuel. Its size and economic importance do not permit it to be overlooked even in the dry months when the herbs, associated with it in the more favorable seasons, are absent. It becomes evident, therefore, that this conspicuous cactus serves as a ready index to the extent and distribution of the fog-bathed fertile slopes. From the mention of the occurrence of the plant by travelers and from observations of it made with field-glasses from the steamer one may say with fair confidence that the fertile areas are most abundant and best developed on the stretch of coast from the vicinity of Tocopilla south near Antofagasta. South of the hills near La Chimba, just north of Antofagasta, the coast is particularly barren. Only as Botija is approached, nearly 100 km. to the south, does an evident vegetation reappear, cf. Philippi, Viage Des. Atacama 28–30 (1860). A little south of this point and just beyond our area, however, are the very moist and very fertile slopes which stretch between Miguel Diaz and Paposo. North of Tocopilla the fertile areas are small and scattered and probably best developed on the slopes just above Iquique. I understand that there is a weak development of the flora as far north as Caleta Buena. Beyond that point, however, and practically to Arica, the coast is essentially barren.

Of the 117 species reported from the area practically all occur in the coastal hills farther south in the departments of Chañaral and Taltal, the only exceptions being 23 endemic species and 5 Peruvian species that reach their southern limit in the area. Although geo-

graphically nearer Peru the region is floristically closer to Atacama, a fact which may be due to the edaphic effects resulting from the change in coastal topography that occurs just south of Arica. At that place the hills abruptly rising from the sea, so characteristic of most of the Chilean littoral, give way to the broad gently ascending coastal terraces that are so well developed about Arica, Mollendo and farther north. In any case the flora of Arica is very different as to species from that of the most northern of the major nitrate ports, Iquique, although to be sure both are of the Loma type and have many characteristic genera in common. The flora of the Nitrate Coast seems to be scarcely more than an impoverished northern extension of the Paposo flora.

Much of the early collecting in the region was done at Cobija which is situated between Antofagasta and Tocopilla and is now practically deserted. During most of the first half of the last century it was one of the principal ports-of-call between Coquimbo and Arica. It was under the Bolivian flag and from it started one of the main routes to the Bolivian plateau. Hugh Cuming visited and collected at Cobija in September, 1828. Unfortunately his plants were distributed under a general printed label reading "Cobija, Iquiqui et Arica" and consequently the precise source of his specimens is unknown. The plants of this series bear his numbers 912–959 inclusive! The elder Hooker has made further confusion by labeling them in his herbarium as from Peru and even as from Lima! The most of this range of numbers came, I believe, from Arica. A. d'Orbigny collected about Cobija in April, 1830. A large collection was also made there by M. Gaudichaud who was in the port July 1–3, 1836. Thomas Bridges, Hook. Jour. Bot. iv. 572–3 (1845), did a little collecting at Cobija in September, 1844. His plants were distributed with those he collected on the plateau and in the Amazonian forests, and like them merely labeled as from Bolivia.

About Antofagasta little collecting has been done. Herzog collected there in September, 1911 and Rose in October, 1914. Recently a small collection was made there by Pennell in April, 1925. The only collections I know of from Tocopilla are those I saw at Santiago, These were by Vidal in September, 1889, and Gülland in 1918 and by Mozer and by Reiche at unnoted dates. At Santiago I also saw collections from Iquique made by Salinas in December, 1913 and at Quebrada de Huantaca near Iquique by Martens in September, 1904. Recently Werdermann has collected in Quebrada Huantajaya near Iquique and distributed his exsiccatae widely. Rose also collected at Iquique in 1914.

My own collections which form the basis of the subjoined catalogue were made in 1925, a phenomenally rainy year for the region. Plants during this year appeared on slopes very much lower than normal. Having a day ashore at Tocopilla on October 18th I hired an automobile and drove north from the town to below a steep quebrada which is just beyond the switch-backs on the railroad and about opposite Caleta Duendas. Here plants grew almost to the base of the hills. I climbed well up the slope and into the *Cereus*-belt and eventually returned to the steamer with a bulging vasculum. The following day I had another opportunity to go ashore at Antofagasta. Hiring another automobile I drove north towards Quebrada de la Chimba but could not reach it because of washed out roads. Leaving the car several kilometers short of this abandoned objective I walked eastward across a sandy plain to the foot of the hills where in and about the mouth of a small quebrada I filled my vasculum without the necessity of climbing the slopes. I obtained 86 numbers during these two short excursions, 52 at Tocopilla and 34 at Antofagasta.

There is very little literature bearing directly upon the flora of the Nitrate Coast. The most important source of information is found in a few pages of Reiche's Grundzüge der Pflanzenverbreitung in Chile [Engler & Drude, Veg. Erde viii.] 164–166 (1907). In this work Reiche gives an incomplete list of the plants known from about Iquique and Tocopilla. The only other attempts at listing the flora in any part of the area are much less satisfactory and even less complete. Herzog, Engler & Drude, Veg. Erde xv. 229 (1923), gives a short list of plants collected near Antofagasta, and Philippi, Viage Des. Atacama 33–34 (1860), mentions the few he was able to find about the Morro de Mejillones. Most naturalists who have visited the region have dismissed it as absolutely barren of all plants. Ball, Notes of a Naturalist in So. Amer. 128–129 (1887), likens the coast to the waterless landscape of the moon.

The following catalogue is primarily based upon my own collections. I have incorporated in it, however, all the published records that I could locate and have cited all the specimens from the region which I have been able to study here in Cambridge. My own collections were determined in the herbarium of the Museo Nacional at Santiago where I was able to compare them with critical material in the Philippi Herbarium. While studying at Santiago I had no intention of publishing upon the flora of the Nitrate Coast and, consequently, did not take special note of the material from the region which I saw there. In the course of critical comparisons of my collections of this region and of those from Chañaral and Taltal, however, I did make note

of a goodly number of the specimens from the Nitrate Coast found in the collections at Santiago. Consequently I have been able to cite a good proportion of the interesting collections from the region found there.

CATALOGUE OF SPECIES

POLYPODIACEAE

Adiantum chilense Kaulf., var. **hirsutum** Hook. in Hook. & Grev. Icon. Fil. ii. t. 173 (1829).

Growing under rocks on a hillside near Tocopilla (*J. 3580*).

Notholaena mollis Kunze, Linnaea ix. 54 (1834).

Growing under rocks on a hillside near Tocopilla (*J. 3581*). Also collected near Iquique by Rose (no. *19451*).

GNETACEAE

Ephedra breana Ph. Anal. Univ. Chile xci. 519 (1895).

I doubtfully refer here a staminate plant with pale sheaths which formed subprostrate masses on a rocky ledge on a hill near Tocopilla (*J. 3613*). The sheaths are better developed than in more southern forms. Perhaps the plant may be only a form of *E. americana* H. & B.

Ephedra

Specimens from what appears to be a loosely branched bush were collected near Antofagasta by Rose (no. *19414*). The plant is staminate and has brown sheaths. An infertile specimen, but more compactly branched, collected near Antofagasta by Pennell (no. *13036*) is apparently conspecific. Lacking fruit an attempt at determination seems unwise.

GRAMINEAE

Stipa tortuosa Desv. in Gay, Fl. Chile vi. 281 (1853).

Collected near Antofagasta by Rose (no. *19415*).

Stipa plumosa Trin. Mem. Acad. St. Petersb. ser. 6, ii. 37 (1836).

Growing about rocks in hills near Antofagasta (*J. 3657*) and Tocopilla (*J. 3582*).

Stipa annua Mez in Fedde, Repert. xvii. 204 (1921).

On a gravelly hillside near Tocopilla (*J. 3579*).

BROMELIACEAE

Puya boliviensis Baker, Handb. Brom. 126 (1889).

Known only from the type collected at Cobija by Gaudichaud.

LILIACEAE

Scilla triflora Ph. Fl. Atac. 51 and Viage Des. Atac. 225 (1860).

Infrequent on a gravelly hillside near Tocopilla (*J. 3610*). A very mature specimen from Antofagasta (*Pennell 13037*) is probably the same.

Pasithea caerulea (R. & P.) Don, var. **grandiflora**, var. nov., speciosa; lobis perianthii 2 cm. longis.—CHILE: growing about rocks on a hillside near Tocopilla, Oct. 18, 1925, *Johnston 3608* (TYPE, Gray Herb.).

This was a common and very conspicuous plant on a hillside near Tocopilla. The corolla, though very large and of an attractive purple color, has a disagreeable odor. Reiche, Grundz. Pfl. Chile 166 (1907), reported *P. caerulea* from Tocopilla apparently upon a specimen of this variety, past flowering, which I examined in the museum at Santiago.

Leucocoryne narcissoides Ph. Fl. Atac. 52 and Viage Des. Atac. 226 (1860).

I refer to this species collections from slopes near Tocopilla (*J. 3609*) and from Queb. Huantajaya near Iquique (*Werdermann 759*). The plant seems to be very variable. The plant from Iquique reported as *L. ixioides* by Reiche, Grundz. Pfl. Chile 166 (1907), is the same.

AMARYLLIDACEAE

Cummingia campanulata (Lindl.) Don ex Sweet, Brit. Fl. Garden iii. t. 257 (1828).

A collection from Tocopilla, apparently of a large-flowered form, is in the museum at Santiago. Reiche, Grundz. Pfl. Chile 166 (1907), reported the species from Tocopilla apparently upon the basis of this collection.

Zephyra elegans Don, Edinb. New Philos. Journ. xiii. 236 (1832). *Z. amoena* Miers, Trans. Linn. Soc., Bot. xxiv. 503, t. 53 (1864).

The types of *Z. elegans* and *Z. amoena* both came from Iquique. Baker, Jour. Linn. Soc. xvii. 495 (1879), considers them synonymous. Miers's plate, however, shows a plant quite different in corolla-proportions from any collection seen by me; the lobes of the corolla being illustrated as scarcely if at all surpassing the narrow tube. I have a collection from the hills near Tocopilla (*J. 3611*) and have seen material from Iquique quite similar to typical *Dicolus caerulescens* Ph., a species considered indistinguishable from *Z. elegans*.

Alstroemeria violacea Ph. Fl. Atac. 51 and Viage Des. Atac. 225 (1860). *A. paupercula* Ph. l. c.

This beautiful species was collected in the hills near Antofagasta (*J. 3634*) and Tocopilla (*J. 3612*). Reiche, Grundz. Pfl. Chile 166 (1907), also reports it from Tocopilla. The type and only known collection of *A. paupercula* was collected on the Morro de Mejillones and appears to be merely a starved and over-mature specimen of *A. violacea*.

DIOSCOREACEAE

Dioscorea cylindrostachya Johnston, supra pg. 25.

Common on dunes at the base of the hills near Antofagasta (*J. 3645*, type).

IRIDACEAE

Tigridia Philippiana Johnston, supra pg. 26.

Collected in 1904 at Tocopilla by Mozer.

URTICACEAE

Parietaria debilis Forst. Prodr. 73 (1786).

Collected on a gravelly bench in a quebrada near Antofagasta (*J. 3644*) and in Queb. Huantajaya near Iquique (*Werdermann 755*).

SANTALACEAE

Quinchamalium

A collection by Gaudichaud from Cobija is cited as *Q. chilense* Lam. by DeCandolle, Prodr. xiv. 625 (1857). I suspect that the material is referable to *Q. carnosa* Ph.

CHENOPODIACEAE

Chenopodium hastatum Ph. Fl. Atac. 47 and Viage Des. Atac. 221 (1860).

Collected in Queb. Huantajaya near Iquique by Werdermann (no. *756*). Reiche, Grundz. Pfl. Chile 165 (1907), reported the plant from Iquique as *C. sparsiflorum* Ph. and later, Fl. Chile vi. 158 (1911), as *C. paniculatum* Hook.

Atriplex taltalensis Johnston, supra pg. 30.

Collected on the rocky floor of a quebrada near Antofagasta (*J. 3635*). This material is not quite typical, having reddish stems that are somewhat more slender and foliage that is slightly less scurfy than in the type.

Suaeda foliosa Moq. in DC. Prodr. xiii. pt. 2, 156 (1849).

Collected near Iquique by Rose (no. *19450*). The plant reported

as *S. divaricata*, also from Iquique, is probably the same, Reiche, Grundz. Pfl. Chile 165 (1907).

NYCTAGINACEAE

Oxybaphus elegans Choisy in DC. Prodr. xiii. pt. 2, 431 (1849). Growing on a hillside near Tocopilla (*J. 3593*).

AIZOACEAE

Tetragonia maritima Barn. in Gay, Fl. Chile ii. 469 (1846).

A shrub 5–10 dm. tall collected near Antofagasta by Pennell (no. *13029*) and by Rose (no. *19420* in pt.).

Tetragonia ovata Ph. Anal. Univ. Chile lxxxv. 168 (1893).

Known from near Antofagasta (*Pennell 13024; J. 3643*) and Tocopilla (*Reiche, Mozer, J. 3598*). The report of *T. crystallina* from Antofagasta by Herzog, Meded. Rijks Herb. no 40, 12 (1921), is probably based upon a misdetermination of this species.

PORTULACACEAE

Calandrinia capitata H. & A. Bot. Misc. iii. 334 (1833).

Growing on a gravelly hillside near Tocopilla (*J. 3592*).

Calandrinia calycina Ph. Fl. Atac. 21 and Viage Des. Atac. 195 (1860).

In sandy places near Antofagasta (*J. 3652*) and on a gravelly hillside near Tocopilla (*J. 3590*).

Calandrinia cephalophora Johnston, supra pg. 35.

Collected in a quebrada near Antofagasta (*Pennell 13032*) and on a gravelly hillside near Tocopilla (*J. 3591*, type).

Calandrinia chrysantha, sp. nov., annua herbacea glaberrima; radice palari; caulibus simplicibus vel saepe fere a basi in ramos laxe ascendentes plures 3–5 cm. longos ca. 2 mm. crassos decompositis ad apicem versus foliatis et inde a pedunculo gracili aphyllo 4–6 cm. longo terminatis; foliis obovatis carnosis inferioribus laxe rosulatis 4–6 cm. longis 2–3 cm. latis obtusis infra medium in petiolum 1–2 cm. longum contractis, caulinis paucis ovato-lanceolatis, supremis non rariter suboppositis; corymbo 2–3 cm. crasso laxiflori; bracteis corymbi lanceolatis vel subulatis 2–4 mm. longis; pedicellis gracilibus ascendentibus vel vetustate deflexis 8–12 mm. longis; sepalis ca. 5 mm. longis late orbicularibus conspicue nigro-venosis equitantibus exteriori imam ad basem subamplexicauli; petalis aureis orbicularibus 4–5 mm. longis apice rotundis sepala vix superantibus; staminibus ca.

11–13; capsula globoso-ovoidea sepalis subaequali ca. 5 mm. longa; seminibus numerosis ca. 0.9 mm. longis minute tuberculatis.—CHILE: on a gravelly steep hillside near Caleta Duendes near Tocopilla, Oct. 18, 1925, *Johnston 3589* (TYPE, Gray Herb.).

This species belongs to Reiche's section *Rosulatae* and is apparently most closely related to *C. cymosa* Ph. from which it differs in having larger and broader petals and sepals, narrow bracts, broader and larger capsules and bright green herbage. It was noted in the field that the calyces of *C. chrysantha* were clammy and slightly glutinous.

Calandrinia cachinalensis Ph. Fl. Atac. 20 and Viage Des. Atac. 194 (1860).

I refer here doubtfully a very mature and incomplete specimen from Antofagasta (*Pennell 13025*). Although denuded of most of the inflorescence and lacking the root the specimens seem very similar to authenticated material of *C. cachinalensis*. The seeds are covered with short brownish hairs.

Calandrinia grandiflora Lindl. Bot. Reg. xiv. t. 1194 (1828).

Reiche, Grundz. Pfl. Chile 165 (1907), reports this species from Iquique. I feel confident, however, that study will show that this species does not occur in our area and that Reiche has misdetermined his plant. He probably had one of the large coarse species of the genus but which one I do not care to guess.

Silvaea amarantoides Ph. Fl. Atac. 22 and Viage Des. Atac. 196 (1860).

Growing on dunes at the foot of the hills near Antofagasta (*J. 3653*).

CARYOPHYLLACEAE

Drymaria cordata (L.) Willd. ex R. & S. Syst. v. 406 (1819).

Collected on a gravelly hillside near Tocopilla (*J. 3620*).

Spergularia aberrans, sp. nov., perennis; caulibus numerosis gracilibus e caudice fruticoso prostrato laxe ramoso decumbentibus numerosis 1.5–3 dm. longis sparse breviterque villosis glandulosis internodiis 1.5–4 cm. longis; foliis linearibus subteretibus 1.5–2.5 cm. longis 0.6–1 mm. latis cuspidulatis glabratis rariter glandulosis quam internodiis brevioribus; stipulis 5–7 mm. longis hyalinis lanceolatis attenuatis apicem versus non rariter laciniatis basi connatis; floribus paucis cymosis; bracteis linearibus 3–5 mm. longis; pedicellis glanduloso-puberulentis 5–20 mm. longis ascendentibus; sepalis anguste lanceolatis 6–7 mm. longis 1–1.2 mm. latis acutis glandulosis puberulentis margine anguste scariosis; petalis albis oblongo-ovatis ca. 2 mm. latis sepalis aequilongis apice acutis; staminibus 5 ca. 3 mm.

longis ovario ellipsoideo breviter stipitato sesquilongioribus; stylo 1–1.3 mm. longo in media parte trilobato; capsula trivalva ca. 6 mm. longa ad 2.5 mm. crassa cylindrico-lanceolata sepalis maturis paullo breviori; seminibus ignotis.—CHILE: sprawling from rock crevices in a quebrada near Antofagasta, Oct. 19, 1925, *Johnston 3631* (TYPE, Gray Herb.).

This species is most closely related to *S. stenocarpa* (Ph.) Johnston and *S. fasciculata* Ph. It is, however, readily distinguished by its habit and few (only 5) stamens. In its reduced androecium and united styles the species is atypical of its genus. Mature seeds indubitably of this species I have not seen. There are, however, a few seeds of apparently a *Spergularia* which were adhering to the plant and probably were produced by it. These are dull black, ca. 0.8 mm. long, narrowly wing-margined and sparsely tuberculate on the sides.

CAPPARIDACEAE

Cleome chilensis DC., var. **pubescens** DC. Prodr. i. 239 (1824).

Growing on a gravelly slope near Tocopilla (*J. 3601*) and in Queb. Huantajaya near Iquique (*Werdermann 765*). Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

CRUCIFERAE

Menonvillea parviflora Ph. Fl. Atac. 8 and Viage Des. Atac. 182 (1860).

What is apparently a form of this species was collected at Tocopilla by Reiche. It is probably this collection that is reported from Tocopilla by Reiche, Grundz. Pfl. Chile 166 (1907), as *M. Gayi*.

Descurainia minutiflora (Ph.) Reiche, Anal. Univ. Chile xc. 148 (1895) and Fl. Chile i. 118 (1896).

I refer here a collection from a gravelly hillside near Tocopilla (*J. 3600*). Although the type of *D. minutiflora* came from the puna in Los Andes, Argentina, it agrees with the collection from Tocopilla in the flowers, size and shape of fruit, inflorescence and cut and size of leaves.

Sisymbrium sagittatum H. & A. Bot. Miscl. iii. 139 (1833).

Collected near Tocopilla (*Reiche*) and on the gravelly floor of a quebrada near Antofagasta (*J. 3641*).

Mathewsia collina, sp. nov., fruticosa decumbens 3–5 dm. alta; ramis ascendentibus vel erectis albidis leviter stellatis; foliis confertis pinnatifidis vel pinnatipartitis 4–6 cm. longis 1.5–3 cm. latis pallide viridibus cum pilis minutis stellatis vestitis subsessilibus basi semi-

amplexicaulibus et saepe subauriculatis ambitu oblongo-oblanceolatis, lobis pluribus 3–7-jugatis oblongis obtusis; pedunculis 3–6 cm. longis; pedicellis ascendentibus 8–14 mm. longis; sepalis ca. 7 mm. longis 2–2.5 mm. latis oblongis obtusis leviter stellatis; petalis ochroleucis spathulatis ca. 11 mm. longis ca. 2.5 mm. latis obtusis longe angusteque unguiculatis; filamentis 5 et 6 mm. longis glabris linearibus; antheris erectis 2.5–3 mm. longis; pistilo 6–7 mm. longo sessile; stylo ca. 0.5 mm. longo; stigmate capitato; ovario dense minuteque stellato-canescenti ca. 40-ovulato; siliquis 2.5–3 cm. longis 4–5(–6) mm. latis dense canescenter stellato-tomentosis; seminibus brunneis ruguloso-tuberculatis.—CHILE: a small erectly branched bush on a hillside near Caleta Duendas near Tocopilla, Oct. 18, 1925, *Johnston 3599* (TYPE, Gray Herb.).

This plant is obviously related to *M. laciniata* Ph. and to *M. foliosa* H. & A. From the former, with which it is probably most closely related, it agrees in having broad auriculate leaf-bases, pubescent fruit, etc., but differs from it in its rather smaller flowers, very conspicuously less dense pubescence and green rather than canescent more lobed leaves. From *M. foliosa*, which ranges south of Coquimbo, it differs in its pubescent usually narrower fruit, and less deeply lobed and more densely pubescent leaves.

LEGUMINOSAE

Cassia Brongniartii Gaud. Voy. Bonite, Bot. Atlas t. 10 (1840–42). *C. conjugata* R. & P. ex Benth. Trans. Linn. Soc. xxvii. 50 (1871).

The material used as the basis of the beautiful plate of *C. Brongniartii* probably came from Cobija, for material cited by Bentham, l. c., as representative of the synonymous species *C. conjugata*, includes a collection made at Cobija by Gaudichaud.

Hoffmanseggia gracilis (R. & P.) H. & A. Bot. Miscl. iii. 209 (1833).

Growing on a gravelly hillside near Tocopilla (*J. 3622*).

Astragalus viciiformis Ulbr. Bot. Jahrb. xxxvii. 550 (1906).

Collected on a hillside near Tocopilla (*J. 3621*) and in Queb. Huantajaya near Iquique (*Werdermann 754*). Previously this species has been known only from Mollendo.

Astragalus melanogonatus Johnston, supra pg. 52.

Growing in sandy places at the foot of the hills near Antofagasta (*J. 3632*).

Adesmia tenella H. & A. Bot. Beechey Voy. 19 (1830).

A colony of this species was found on a gravelly hillside near Tocopilla (*J. 3623*).

OXALIDACEAE

Oxalis ornithopus Ph. Fl. Atac. 13 and Viage Des. Atac. 187 (1860).

Growing on a rocky slope in the hills near Tocopilla (*J. 3595*).

Oxalis micrantha Bertero ex Colla, Mem. Accad. Torino xxxvii. 50 (1831).

Collected on a gravelly slope near Tocopilla (*J. 3596*).

Oxalis bulbocastanum Ph. Anal. Univ. Chile lxxxii. 1095 (1893).

Collected in Queb. Huantajaya near Iquique by Werdermann (no. *762*). Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

Oxalis gageiflora Knuth, Meded. Rijks Herb. Leiden no. 27, 65 (1915).

This species was based upon material collected at ca. 300 m. alt. in the hills near Antofagasta by Herzog. I know it and the following species only from description.

Oxalis occidentalis Knuth, Meded. Rijks Herb. Leiden no. 27, 66 (1915).

Described from material collected at ca. 300 m. alt. near Antofagasta by Herzog.

TROPAEOLACEAE

Tropaeolum leptoceras, sp. nov., scandens glaberrimum; caulibus tenuibus; foliis peltatis fere ad basem in lacinias 5–6 stellatim distantes spathulatas vel oblanceolatas rotundas vel obtusiusculas 8–15 mm. longas 4–8 mm. latas dissectis 1.5–3 cm. diametro; petiolis 1–2 cm. longis contortis exstipulatis; floribus in axillis foliorum solitariis 2.5–5 cm. longe pedunculatis 2–2.5 mm. longis; calcare ab insertione pedunculi usque ad apicem 8–10 mm. longo recto subulato flavo vel paullo brunnescenti apertura 1–2 mm. diametro; sepalis ovatis vel ellipticis flavis 4–5 (maturitate ad 6) mm. latis subimbricatis basi 2–4 mm. longe connatis apice rotundis; petalis subhomomorphis luteis calycem conspicue superantibus obovatis integerrimis sed apice breviter emarginatis 7–8 mm. latis unguiculatis, lamina (ungue incluso) ca. 11 mm. longa; fructibus ignotis.—CHILE: growing in shelter of rocks on a hillside near Caleta Duendas near Tocopilla, Oct. 18, 1925, *Johnston 3597* (TYPE, Gray Herb.).

In Reiche's treatment of the Chilean species, Fl. Chile i. 297 (1896), this species keys out with *T. brachyceras* H. & A., from which it differs in its elongate very slender spur and very much larger petals. It

seems, however, to be most closely related to *T. Kingii* Ph. of Atacama. From that species it differs in its larger flowers, straight more slender subulate spur, larger more richly colored emarginate petals and much larger leaves. The root-structures are not known. Its obvious relatives, however, are all said to have small tubers.

MALPIGHIACEAE

Dinemandra ericoides Juss. Ann. Sci. Nat. ser. 2, xiii. 255 (1840). The type of this species was collected at Cobija by Gaudichaud. Material has also been collected near Antofagasta (*Rose 19412; J. 3647*). In my collection from Antofagasta the third stamen exhibits all degrees of development in the size of anther and in length of filament.

EUPHORBIACEAE

Chiropetalum canescens Ph. Fl. Atac. 49 and Viage Des. Atac. 223 (1860). *Argyrothamnia Sponiella* Müll. Arg. Linnaea xxxiv. 148 (1865).

An erect tufted perennial growing in rock-crevices in the hills near Antofagasta (*J. 3646*). The type of *A. Sponiella* was collected by Gaudichaud near Cobija.

MALVACEAE

Palaua inconspicua, sp. nov., annua herbacea; caulibus erectis vel plus minusve decumbentibus solitariis vel pluribus 1–2 dm. longis gracilibus simplicibus vel rarius breviter sparseque ramosis subangulatis vel teretibus pilis stellatis minutis numerosis vestitis internodiis 1–6 cm. longis; foliis vix rosulatis homomorphis supremis reductis; lamina orbiculari-cordata vel reniformi-cordata obtusa 1–3.5 cm. longa et lata plus minusve obscure 3–5-lobata basi cordata supra pilis stellatis minutis sparse vestita, subtus pallidiori pilis stellatis minutis numerosis et nerviis 5 palmatis prominentibus ornata; petiolis gracilibus medio-caulinis laminae subaequilongis pilis stellatis numerosis vestitis; stipulis subulatis persistentibus 2–5 mm. longis ciliatis; pedunculis gracilibus 1–3 cm. longis pilis stellatis vestitis axillaribus 1–5-floris; pedicellis gracillimis 1–4 mm. longis; calyce ad anthesim campanulato 2–3 mm. longo pilis stellatis vestito 5-lobato, fructifero depresse globoso 3–4 mm. longo, lobis ovatis; petalis albis 2–3 mm. longis calycem vix superantibus; fructu per calycem occulto depresso 3–4 mm. diametro; carpidiis 20–25 monospermis ca. 0.9 mm. longis glabris rugosis fuscis compresso-ovoideis; seminibus ca. 0.7

mm. longis.—CHILE: infrequent on a gravelly hillside near Tocopilla, Oct. 18, 1925, *Johnston 3617* (TYPE, Gray Herb.). PERU: infrequent in sandy soil at the lower edge of the fertile belt in hills back of Mollendo, Dept. Arequipa, Oct. 16, 1925, *Johnston 3565*.

A species closely related to *P. modesta* (Ph.) Reiche of the Paposo region, but differing in being distinctly annual, in having shorter less conspicuously spreading hairs and smaller corollas. My collections of the new species have dried a pale green but those of *P. modesta* have dried very dark.

Malvastrum peruvianum (L.) Gray, Bot. U. S. Explor. Exped. 146 (1854).

Growing on a gravelly hillside near Tocopilla (*J. 3618*).

Cristaria diversifolia Ph., f. **parvula** (Ph.) Johnston, supra pg. 76.

Local on a gravelly bench in a quebrada near Antofagasta (*J. 3630*). I doubtfully also place here collections from a hillside near Tocopilla (*J. 3619, 6298*). This latter material although having simple basal leaves has those of the stems deeply lobed. The collection from Antofagasta has all the leaves simple and with straight entire margins.

Cristaria formosula Johnston, supra pg. 74.

Growing in sandy soil in and just below a quebrada in the hills near Antofagasta (*J. 3629*). An excessively mature plant collected by Pennell (no. *13020*) near Antofagasta is probably the same.

FRANKENIACEAE

Frankenia chilensis Presl, var. **aspera** (Ph.) Johnston, supra pg. 77. *F. farinosa* Remy, Ann. Sci. Nat., Bot. ser. 3, viii. 236 (1847).

I refer here material collected near Antofagasta by Rose (*sine num.*). The type of Remy's species was collected near Cobija by Gaudichaud.

VIOLACEAE

Viola polypoda Turcz. Bull. Soc. Nat. Moscou xxxvi. pt. 1, 555 (1863). *V. Werdermannii*, f. *glaberrima* Becker in Fedde, Repert. xxiii. 223 (1926).

Known from rocky quebradas near Antofagasta (*Rose 19424, Pennell 13034, J. 3642*) and from ca. 700 m. alt. in the hills near Iquique (*Werdermann 760*). The collection from Iquique is the basis of *V. Werdermannii*, f. *glaberrima*. My collection from Antofagasta was determined as *V. Werdermanii* Becker by the author of the species. The petals are yellow.

MALESHERBIACEAE

Malesherbia humilis Poepp. in Froriep, Notizen xxiii. 291 (1829).

Collected on a hillside near Tocopilla (*J. 3614*) and in the hills near Antofagasta (*Pennell 13033, J. 3627*). I also have material from Blanco Encalada a locality ca. 15 km. inland from Antofagasta. Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

LOASACEAE

Mentzelia ignea (Ph.) Urb. & Gilg. in E. & P. Nat Pflanzenf. iii. Abt. 6a, 110 (1894).

Reported from Cobija where it is said to have been collected by Gaudichaud, cf. Urban & Gilg, Monog. Loasac. 59 (1900). Reiche, Grundz. Pfl. Chile 166 (1907), reports it from Tocopilla.

Loasa urens Jacq. Obs. ii. 15, t. 38 (1767).

Frequent on a gravelly hillside near Tocopilla (*J. 3616*). Urban & Gilg, Monog. Loasac. 235 (1900), doubtfully refer to the species a collection made by Gaudichaud at Cobija.

Loasa sessiliflora Ph. Anal. Univ. Chile lxxxv. 12 (1893).

I refer to this very distinct species a battered collection from a bare rocky quebrada near Antofagasta (*Pennell 13026*). The material although very mature agrees well with authenticated collections from the type-region.

Loasa tricolor Ker, Bot. Reg. viii. t. 667 (1822).

Material referable to a variety of this species or to a closely related undescribed species was collected on gravelly slopes near Tocopilla (*J. 3615*) and in a quebrada near Antofagasta (*J. 3628*). The same form has been collected as far south as Taltal.

Loasa longiseta Ph. Anal. Univ. Chile xxvii. 347 (1865).

Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

CACTACEAE

Opuntia sphaerica Först. Hamb. Gartenz. xvii. 167 (1861).

Collected near Antofagasta by Rose (no. *19523*) and by Pennell (no. *13038*). Pennell describes the petals as "Eugenia-red."

Opuntia

A low yellow-flowered species of this genus is reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

Cereus iquiquensis K. Schum. Monatsschr. Kakteenk. xiv. 99 (1904).

The type of this species was collected at Iquique by Reiche. Britton & Rose, Cact. ii. 83 (1920), report the species from Iquique and

Antofagasta. The large columnar cactus I observed in the hills near Tocopilla and Antofagasta obviously belongs here. The plant from Mejillones reported as *Eulychnia breviflora* by Philippi, Viage Des. Atac. 34 (1860), is no doubt the same.

Echinocactus marginatus Salm-Dyck, Allg. Gartenzeit. xiii. 386 (1845).

Collected by Pennell (no. *13039*) and by Rose (no. *19410*) near Antofagasta whence it is also reported by Britton & Rose, Cact. iii. 86 (1922). The types of this species and its several synonyms were probably obtained at Cobija as that was a frequented port-of-call during the first half of the last century when the plants were collected. The material from Cuming and from Bridges mentioned by Schumann, Kakteen 311 (1898), almost certainly came from Cobija.

ONAGRACEAE

Oenothera verrucosa Johnston, Contr. Gray Herb. lxx. 77 (1924). *Oe. arequipensis* Munz & Johnston, Contr. Gray Herb. lxxv. 20 (1925).

I refer here a plant which was frequent on a gravelly hillside near Tocopilla (*J. 3602*). The yellow petals are ca. 8 mm. long and the hypanthium is 1–1.5 cm. long. It seems necessary to admit in the present species considerable variation in size of flower. It is separated from *Oe. laciniata* Hill by having a shorter and stouter straight capsule noticeably contracted at the base and apex. From *Oe. coquimbensis* Gay it differs in having ovoid rather than decidedly fusiform seeds.

Oenothera coquimbensis Gay, var. **grandidentata** (Ph.) Reiche, Anal. Univ. Chile xcviii. 476 (1897) and Fl. Chile ii. 258 (1898).

Frequent in sandy places near Antofagasta (*J. 3640*). This is the large-flowered form. The mature bud is 12–15 mm. and the hypanthium 1–1.6 cm. in length.

UMBELLIFERAE

Apium laciniatum (DC.) Urban in Mart. Fl. Bras. xi. pt. 1, 343 (1879).

Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

APOCYNACEAE

Skytanthus acutus Meyen, Reise i. 376 (1834).

A shrub half buried in the dunes at the foot of the hills near Antofagasta (*J. 3649*).

ASCLEPIADACEAE

Cynanchum viride (Ph.) Reiche, Anal. Univ. Chile cxviii. 159 (1906) and Fl. Chile v. 113 (1910).

Scrambling over rocks on the floor of a quebrada near Antofagasta (*J. 3650*).

POLEMONIACEAE

Gilia glutinosa Ph. Linnaea xxx. 196 (1859). *G. cobijanensis* Brand, Pflanzenr. [Heft. 27] iv. Fam. 250, 98 (1907).

Material referable to this species is given by Brand, l. c., as collected at Cobija by Gaudichaud and at Iquique by Reiche.

BORAGINACEAE

Coldenia litoralis Ph. Fl. Atac. 37 and Viage Des. Atac. 211 (1860).

Scattered on a sandy coastal plain at the foot of the hills near Antofagasta (*J. 3658*). The nutlets are slightly more prominently roughened than in material from further south. The corolla is bluish.

Coldenia grandiflora Ph. Cat. Pl. Itin. Tarapacá 55 (1891).

On dunes near Antofagasta (*J. 3660*). The corollas are large and bright blue in color.

Heliotropium

An apparently unnamed species, belonging to the immediate group of *H. floridum* Clos, has been collected near Antofagasta (*Pennell 13022*) and near Iquique (*Salinas*). The material available is inadequate for a thorough study of the plant, cf. Johnston, Contr. Gray Herb. lxxxi. 38 (1928).

Cryptantha filiformis (Ph.) Reiche, Anal. Univ. Chile cxxi. 829 (1908) and Fl. Chile v. 234 (1910). *Eritrichium mite* Ph. Anal. Univ. Chile xc. 539 (1895). *C. mitis* Reiche, l. c.

Collected near Tocopilla (*Vidal*, type of *E. mite; J. 3578*), in Queb. Huantaca near Iquique (*Martens*), in Queb. Huantajaya near Iquique (*Werdermann 764*) and near Caleta Buena (*Paessler*). The plant was incorrectly reported from Tocopilla and Iquique under the name *C. subamplexicaulis* by Reiche, Fl. Chile v. 231 (1910).

Cryptantha filaginea (Ph.) Reiche, Anal. Univ. cxxi. 829 (1908) and Fl. Chile v. 234 (1910).

Growing in a quebrada near Antofagasta (*J. 3659*).

Cryptantha glomerata Lehm. ex F. & M. Ind. Sem. Hort. Petrop. ii. 35 (1836).

Growing on a steep hillside near Tocopilla (*J. 3577*). This is the coarse northern form described as *Eritrichium strictum* Ph.

Amsinckia hispida (R. & P.) Johnston, Contr. Gray Herb. lxxiii. 75 (1924).

Growing on hillsides near Tocopilla (*Gülland, J. 3576*) and in Queb. Huantajaya near Iquique (*Werdermann 761*).

LABIATAE

Salvia paposana Ph. Fl. Atac. 39 and Viage Des. Atac. 213 (1860).

Infrequent on gravelly slopes near Tocopilla (*J. 3624*).

Stachys grandidentata Lindl. Bot. Reg. xiii. t. 1080 (1827).

This species is reported from Tocopilla by Reiche, Grundz. Pfl. Chile 166 (1907). The correctness of the determination is most questionable and I suspect that the plant is probably referable to *S. pannosa* Ph., a species which occurs in the Paposo region.

NOLANACEAE

Nolana Gayana (Gaud.), comb. nov. *Alibrexia Gayana* Gaud. Voy. Bonite, Bot. Atlas tab. 105 (1842–46).

I refer here material collected by Martens at Iquique in 1904. Gaudichaud's plate seems to represent the plant found about Lima which was treated by Lindley, Bot. Reg. xxx. sub t. 46 (1844), as *Alona revoluta* and by Miers, Illust. So. Pl. i. 61 (1850), as *Alibrexia revoluta*. This plant may perhaps be *Nolana revoluta* R. & P., Fl. Peruv. ii. 8, t. 113 (1799), a species based only upon a drawing of a plant from near Camaná in southern Peru. The illustration given, however, shows a glabrous plant with a "ventricose" calyx rather different in shape from the Lima plant. The specimens from Iquique differ from those from Lima in having a longer, rather shaggy pubescence on the stems leaves and calyx, and perhaps a less densely villous corolla-tube. Otherwise, however, it seems quite similar.

Periloba longifolia (Lindl.) Johnston, supra pg. 104. *Nolana grandiflora* Herzog, Meded. Rijks Herb. no. 29, 21 (1916).

Collected near Antofagasta (*Pennell 13019, J. 3638*), Tocopilla (*J. 3604*) and Iquique (*Werdermann 757, Rose 19448*). All this material is slightly smaller throughout than are the common forms of this polymorphous species from further south. The type *N. grandiflora* was collected by Herzog near Antofagasta.

Bargemontia linearifolia (Ph.) Johnston, supra pg. 109. *Nolana linearifolia* Ph. Anal. Univ. Chile xci. 28 (1895). *N. decemloba* Herzog, Meded. Rijks Herb. no. 29, 20 (1916).

The type of *N. decemloba* was collected by Herzog near Antofagasta. It seems to be distinguishable from *N. linearifolia* only by its slightly

smaller corollas. I have seen collections from near Antofagasta (*Pennell 13021, 13027; J. 3637*). The species varies much in the abundance of the glandular puberulence on the herbage, some plants being almost glabrous, others densely glandular puberulent.

Bargemontia aplocaryoides (Gaud.) Johnston, supra pg. 110. *Leloutrea aplocaryoides* Gaud. Voy. Bonite, Bot. Atlas tab. 110 (1842–46). *Alona pusilla* Ph. Fl. Atac. 45 (1860).

Collected on the dry gravelly plain at the base of the hills near Antofagasta (*J. 3639*). The specimens upon which the original plate of *L. aplocaryoides* was based were almost certainly collected by Gaudichaud at Cobija.

Bargemontia sedifolia (Poepp.) Johnston, supra pg. 110 *Dolia vermiculata* Lindl. Bot. Reg. xxx. sub t. 46 (1844).

Growing in a bare rocky quebrada near Antofagasta (*Pennell 13035*).

Bargemontia clivicola, sp. nov., fruticosa ramosissima erecta pilis minutis erectis abundantibus simplicibus glanduliferis inconspicue obtecta; ramulis gracilibus cortice subpallida vestitis usque ad 2 mm. crassis ca. 5 cm. longis, internodiis 2–10 mm. longis; foliis in nodis solitariis vel rariter subfasciculatis anguste spathulatis 7–10 mm. longis 1–1.5 mm. latis compressis paullo carnosulis apice rotundis ad basem versus evidenter contractis; floribus in axillis foliorum solitariis; pedicellis gracilibus 4–9 mm. longis erectis vel ascendentibus maturitate paullo accrescentibus vix deflexis; calyce 10–12 mm. longo, tubo poculiformi 2–3 mm. longo, lobis linearibus ca. 8 mm. longis ca. 1 mm. latis inaequalibus erectis vel leviter ascendentibus apice rotundis; corolla caerulescenti subtubulosa lobos calycis paullo vel vix superanti 12–14 mm. longa intus glaberrima extus supra medium sparse adpresse villosa, tubo 3–4 mm. longo ca. 1 mm. crasso, faucibus ca. 8 mm. longis ca. 2.5 mm. crassis subcylindricis, lobis ad 2 mm. longis ovatis obtusis ascendentibus; filamentis glaberrimis ca. 4 mm. supra basem corollae affixis 3 et 4.5 mm. longis e faucibus vix exsertis; stylo ca. 1 cm. longo; nuculis saepe ca. 5 ovoideis nigris basi affixis maturitate calycem distendentibus uniseriatis.—CHILE: a bush growing in rocky places in the *Cereus*-belt on the hills near Tocopilla, Oct. 18, 1925, *Johnston 6307* (TYPE, Gray Herb.).

Probably most closely related to *B. foliosa* (Ph.) Johnston of the interior northeast of Tocopilla. It differs from that species, however, in having the more nearly cylindrical corolla scarcely if at all surpassing the calyx-lobes and in being not at all villulose. The stems, leaves, pedicels and calyces in *B. clivicola* are all covered with a short erect simple glandular puberulence which though copious is rather inconspicuous.

Bargemontia inconspicua, sp. nov., fruticosa ut videtur depressa ramosissima pilis villosis erectis sordidis simplicibus glanduliferis dense evidenterque obtecta; ramulis 4–8 cm. longis usque ad 2 mm. crassis, internodiis 3–10 mm. longis; foliis in nodis solitariis vel subfasciculatis linearibus 8–10 mm. longis 1–1.5 mm. latis carnosulis compressis submarcescentibus apice rotundis ad basem versus vix contractis; floribus in axillis foliorum solitariis; pedicellis ad anthesim 1–2 mm. longis erectis deinde saepe crescentibus, fructiferis robustioribus 3–4 mm. longis prope basem deflexis; calyce ad anthesim ca. 12 mm. longo, tubo subcylindrico ad basem versus crassissimo 3–3.5 mm. crasso 7–8 mm. longo, lobis linearibus vel lanceolato-linearibus ca. 5 mm. longis inaequalibus erectis obtusis; calyce fructifero 12–14 mm. longo, tubo subgloboso 4–5 mm. crasso; corolla caerulescenti ca. 12 mm. longa lobos calycis paullo vel vix superanti intus glaberrima extus supra medium sparse adpresseque villoso, tubo 3–4 mm. longo ca. 1 mm. crasso, faucibus 8–9 mm. longis apicem versus paullo ampliatis ca. 2.5 mm. crassis, lobis 1.5–2 mm. longis late ovatis ascendentibus; filamentis glaberrimis 5–5.5 mm. supra basem corollae affixis 2 et 3 mm. longis e faucibus vix exsertis; stylo ad 1 cm. longo; nuculis saepe ca. 5 ovoideis 1.7–2.2 mm. longis nigris basi affixis maturitate calycem distendentibus et mox eum lateraliter horizontaliterque rumpentibus.—CHILE: vicinity of Antofagasta, Oct. 31, 1914, *Rose 19416* (TYPE, U. S. Nat. Herb.).

This plant is very closely related to *B. clivicola* and perhaps may be only a pronounced variety of it. It differs, however, in having recurved fruiting pedicels, much distended fruiting calyces, a conspicuous glandular-villous indument and linear or strap-shaped leaves. It also appears to be a lower and a coarser plant than *B. clivicola*.

Bargemontia mollis (Ph.) Johnston, supra pg. 109.

Herzog, Meded. Rijks Herb. no. 29, 22 (1916), reports the synonymous *Dolia macrocalyx* Ph. from Antofagasta. The determination is almost certainly incorrect.

Bargemontia tocopillensis, sp. nov., fruticosa laxe decumbens glandulosa inconspicue sparseque tomentosa ramosa; ramulis 3–10 cm. longis ca. 1 cm. crassis ascendentibus cum pilis simplicibus mollibus flexuosis vix abundantibus laxe tomentosis et glanduloso-puberulentibus cortice pallido obtectis, internodiis 1–12 mm. longis; foliis fasciculatis 2–6 mm. longis crassiusculis compressis ligulatis ad basem versus latioribus 0.7–1.5 mm. latis ad apicem versus paullo attenuatis obtusis inconspicue glanduliferis cum pilis villosis flexuosis sparse laxeque tomentosis margine leviter revolutis; floribus e fasci-

culis foliorum erumpentibus solitariis; pedicellis gracilibus 2–4 mm. longis ascendentibus sparse tomentosis; calycibus 5–6 mm. longis laxe sparseque tomentosis, tubo poculiformi ad 2.5 mm. longo 2 mm. crasso, lobis linearibus erectis inaequalibus ca. 3 mm. longis herbaceis; corolla caerulescenti 15–16 mm. longa anguste infundibuliformi extus glabrata intus ad basem versus sparse villosa, tubo ca. 1 mm. crasso ca. 4 mm. longo lobos calycis paullo vel vix superanti, faucibus 9 mm. longis sursum gradatim ampliatis ad summam partem ca. 8 mm. diametro, lobis ca. 3 mm. longis suborbicularibus ascendentibus vel subpatentibus; antheris 4–5 mm. supra basem corollae affixis 2.5 et 4.5 mm. longis ad basem versus sparse villosis; stylo ca. 1 cm. longo glaberrimo; nuculis maturitate ignotis.—CHILE: rocky place on slope in *Cereus*-belt on hillside near Tocopilla, Oct. 18, 1925, *Johnston 3603* (TYPE, Gray Herb.).

A very distinct species characterized by its elongate corollas which are merely sparsely villous within, its ligulate fasciculate leaves, its depressed spreading habit and its very sparse tomentose indument and intermixed copious inconspicuous glandular puberulence. The species has also been collected at Tocopilla by Mozer and by Reiche. It is probably most closely related to **B. leptophylla** (*Dolia leptophylla* Miers), the type of which was collected by Cuming (no. *956*) at Cobija, Iquique or Arica! In that species, however, the corolla, which is about as long as in *B. tocopillensis*, has an abruptly dilated campanulate throat, the calyx-lobes are triangular and the leaves are covered with a dense gray tomentum. Whether or not Miers's species has the corolla villous within I do not know. Probably also a relative of the new species is **B. alibrexioides** (*Velpeaulia alibrexioides* Gaud.). The source of the latter is not given although it is rather probable that it came from Cobija. Its leaves are spathulate, the indument is not at all tomentose and the more tubular corolla is quite glabrous inside.

Bargemontia peruviana Gaud. Voy. Bonite, Bot. Atlas tab. 8 (1839–42).

Collected near Antofagasta by Rose (*19420* in pt.) and Pennell (*13017*). Bentham & Hooker, Gen. Pl. ii. 880 (1876), report a collection made by Pearce at Cobija. The specimens forming the basis of the admirably detailed plate of *B. peruviana* were almost certainly collected by Gaudichaud at Cobija.

SOLANACEAE

Lycium chañar Ph. Cat. Pl. Itin. Tarapacá 68 (1891).
Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

In his Flora of Chile, v. 317 (1910), however, he does not report the species from so far north.

Solanum phyllanthum Cav. Icones iv. 35, t. 359 (1797).

A single plant was collected on a hillside near Tocopilla (*J. 3607*).

Solanum brachyantherum Ph. Anal. Univ. Chile xliii. 522 (1873).

I have seen collections from Antofagasta (*Rose 19419, Pennell 13031, J. 3636*) and Tocopilla (*J. 3605*). Reiche, Fl. Chile v. 339 (1910), reports it from Tocopilla and Iquique. Under the name *S. flexuosum* it was reported from Mejillones by Philippi, Fl. Atac. 42 and Viage Des. Atac. 34, 216 (1860), and from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

Solanum chilense (Dunal) Reiche, Anal. Univ. Chile cxxiv. 742 (1909) and Fl. Chile v. 358 (1910).

The type of this species was collected at Cobija by Gaudichaud. I collected it on a rocky slope near Tocopilla (*J. 3606*).

Cacabus

Reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907). Later, however, Reiche, Fl. Chile v. 322 (1910), makes no mention of the plant as occurring near the coast. The determination might have resulted from a misidentification of some species of *Nolanaceae*.

Schizanthus lacteus Ph. Fl. Atac. 45 and Viage Des. Atac. 219 (1860).

Frequent on the gravelly floor of a quebrada near Antofagasta (*J. 3633*). This is the typical white-flowered form. A very mature collection made by Pennell (no. *13028*) near Antofagasta is probably the same.

Schizanthus fallax, sp. nov., annuus herbaceus erectus 2–5 dm. altus laxe ascendenterque longi-ramosus; caulibus inconspicue hispidulis plus minusve glanduliferis; foliis pinnatisectis 4–9 cm. longis 12–30 mm. latis sparse hispidulis margine ciliatis, lobis distantibus paucidentatis vel breviter sparsilobulatis; pedicellis 3–12 mm. longis ascendentibus; calyce 3–5 (fructiferis ad 10) mm. longo 5-partito appresse hispiduloso plus minusve glandulifero, lobis herbaceis paullo inaequilongis lineari-spathulatis vel vere spathulatis cum apice rotundis; corolla 14–18 mm. longa, tubo 3–4 mm. longo 1.5–2 mm. crasso calyce breviori, lobo supremo late obovato 6–8 mm. longo caeruleo integerrimo apice rotundato, lobis lateralibus latis emarginatis nullo modo lobatis caeruleis quam lobo supremo paullo brevioribus; labio tri-parto, parte mediale albo cucullato 4–5 mm. longo quam partibus lateralibus falcatis lineari-spathulatis albis vel rariter caeruleis obtusis evidenter breviori; faucibus ochroleucis purpureo-lineatis.—CHILE:

frequent on gravelly slopes on hillsides near Tocopilla, Oct. 18, 1925, *Johnston 3626* (TYPE, Gray Herb.).

This species, which is the most northern of its genus, is related to *S. pinnatus* R. & P., but differs in having the large upper lateral-lobes of the resupinate corolla merely emarginate and not deeply 4-cleft or 4-lobed. The uppermost lobe of the corolla is proportionately larger and the lower smaller than in *S. pinnatus*. In the coloration of the flower and in the gross habit of the plant *S. fallax* seems very similar to its relative.

Salpiglossis brachysiphon, sp. nov., erecta 2–6 dm. alta gracilis ramosissima, partibus inferioribus glandulari-villosulis sed partibus superioribus glabrescentibus vel stipitato-glanduliferis; caulibus pluribus teretibus ad basim subfruticulosis et caudicem humilem laxum formantibus; foliis axillaribus alternis, inferioribus conspicue pinnatifidis 3–7 cm. longis 1–2 cm. latis lobis irregulariter lobulatis vel dentatis, superioribus et mediis integerrimis lanceolato-linearibus 1–3.5 cm. longis 1–3 mm. latis acutis, supremis gradatim ad bracteas lineares 0.5–1 cm. longas reductis; pedicellis gracilibus laxe ascendentibus 2–5 cm. longis apicem versus dense glanduliferis; calycibus 3–4 mm. longis fusco-nervatis glanduliferis irregulariter breviter dentatis, dentibus erectis vix 1 mm. longis; corolla caesia 7–8 mm. longa extus sparsissime glandulifera intus glaberrima, tubo ad 3 mm. longo cylindrico in calyce occulto, faucibus obliquis ca. 2 mm. longis gradatim ampliatis, limbo obliquo cum nerviis purpureo-marginatis reticulato, labio superiori trilobato, lobo supremo longissimo et latissimo elliptico recto ca. 3 mm. longo ca. 2.5 mm. lato apice rotundo, lobis lateralibus et inferioribus oblongis ca. 2.5 mm. longis; staminibus 4 didynamis inclusis 2 mm. supra basem corollae affixis inferioribus ca. 3 mm. longis, superioribus brevioribus ca. 1.5 mm. longis, antheris suis quam eis in filamentis longioribus triplo majoribus; stigmate eodem *S. chilensis* persimili; capsula calyce persistente investita ovoidea ca. 3 mm. longa; seminibus prismaticis brunnescentibus numerosis alveolatis.—CHILE: infrequent on gravelly slopes in the hills near Tocopilla, Oct. 18, 1925, *Johnston 3625* (TYPE, Gray Herb.).

This is a brittle clammy glandular plant with dilute-blue flowers. It is clearly a close relative of *S. chilensis* (Gay) Wett., from which it differs in its larger calyx, which includes the tube of the less elongated corolla, in its less reduced upper leaves, in being more glandular and in having definitely alveolate seeds.

SCROPHULARIACEAE

Calceolaria paposana Ph. Fl. Atac. 46 and Viage Des. Atac. 220 (1860).

Reported from Tocopilla by Reiche, Grundz. Pfl. Chile 166 (1907) and Fl. Chile vi. 30 (1911).

BIGNONIACEAE

Argylia radiata (L.) Don, Edinb. Philos. Jour. ix. 261 (1823).

Collected on a gravelly bench in a quebrada near Antofagasta (*J. 3648*). Reiche, Grundz. Pfl. Chile 166 (1907), reports the plant from Tocopilla under the name *A. puberula*. The synonymous *A. Feuillei* DC. is reported from Cobija by Gay, Fl. Chile iv. 409 (1849).

PLANTAGINACEAE

Plantago litorea Ph. Fl. Atac. 46 and Viage Des. Atac. 220 (1860).

Growing on dunes near Antofagasta (*J. 3651*).

RUBIACEAE

Galium Aparine L. Sp. Pl. 108 (1753).

Collected at ca. 700 m. alt. in Queb. Huantajaya near Iquique by Werdermann (no. *763*). Also reported from Iquique by Reiche, Grundz. Pfl. Chile 165 (1907).

CUCURBITACEAE

Sicyos bryoniaefolius Moris, Mem. Accad. Torino xxxvii. 106, t. 6 (1831).

Trailing over rocks on a hillside near Tocopilla (*J. 3594*). The fruit is nearly glabrous. Reiche, Grundz. Pfl. Chile 165 (1907), reports it from Iquique.

COMPOSITAE

Ophryosperus triangularis Meyen, Reise i. 402 (1834).

Collected near Antofagasta by Pennell (no. *13018*) and near Cobija by Gaudichaud.

Gnaphalium sphacelatum HBK., var. **chilense** DC. Prodr. vi. 234 (1837).

A frequent annual on hillsides near Tocopilla (*J. 3588*).

Perityle Emoryi Torr., var. **elata** (Ph.) Johnston, supra pg. 127.

Growing in sandy soil (*J. 3654*) and in a bare rocky quebrada (*Pennell 13030*) near Antofagasta. A plant from Klatt's herbarium, now in the Gray Herbarium, determined as "*Villanova oppositifolia*" and collected at Cobija by Gaudichaud, although too mature for certainty, seems also referable here.

Perityle discoidea (Ph.) Johnston, supra pg. 128.

On a gravelly hillside near Tocopilla (*J. 3585*).

Bahia ambrosioides Lag. Gen. et Sp. Nov. 30 (1816).

Growing at ca. 200 m. alt. in a quebrada near Antofagasta (*Pennell 13023*) and on a rocky slope with *Cereus* in the hills near Tocopilla (*J. 3587*). Reiche, Grundz. Pfl. Chile 166 (1907), also reports it from Tocopilla.

Amblyopappus pusillus H. & A. Jour. Bot. iii. 321 (1841).

I found a small colony of this on a gravelly slope near Tocopilla (*J. 3586*) whence it has also been reported by Reiche, Grundz. Pfl. Chile 166 (1907).

Senecio leptanthus Ph. Anal. Univ. Chile lxxxviii. 15 (1894).

Growing on the gravelly floor of a quebrada near Antofagasta (*J. 3655*).

Polyachyrus annuus Johnston, supra pg. 134.

Growing on a gravelly hillside near Tocopilla (*J. 3583*, type) and in Queb. Huantajaya near Iquique (*Werdermann 758*).

Polyachyrus roseus Ph. Fl. Atac. 28 and Viage Des. Atac. 202 (1860).

Collected near Antofagasta by Rose (no. *19418*). I collected an annual, apparently juvenal plant of this species in a quebrada near Antofagasta (*J. 3656*).

Leucheria modesta (Ph.) Reiche, Anal. Univ. Chile cxvi. 192 (1905) and Fl. Chile iv. 415 (1905).

I collected this species on a gravelly slope in the hills near Tocopilla (*J. 3584*) whence it was reported by Reiche, l. c.

Sonchus tenerrimus L. Sp. Pl. 794 (1753).

There is a specimen of this species from Tocopilla in the museum at Santiago which is apparently the basis of Reiche's, Grundz. Pfl. Chile 166 (1907), report of it from that locality.

FAMILY UNKNOWN

Tetreilema boliviense Turcz. Bull. Soc. Nat. Moscou xxxvi. pt. 2, 200 (1863).

The type of this species was collected by d'Orbigny (no. *276*) at Cobija. Turczaninow described two species under his genus *Tetreilema* neither of which has been indentified. He placed *Tetreilema* in the *Verbenaceae* but it seems probable that the two species represent different genera and perhaps even distinct families.

3. Undescribed Species from the Cordilleras of Atacama

Ephedra Wraithiana, sp. nov., erecta fruticem globosum 1–2 m. altum robustum pallide viridem formans; ramulis oppositis erectis 2–3 mm. crassis rigidis 15–20 cm. longis internodiis 5–7 ca. 2–3 cm. longis cortice obscure tuberculatis tenue striatis pallidulis; foliis oppositis 4–5 mm. longis, juventate erectis apicem versus in vaginas cylindricas connatis, lobis subulatis ascendentibus ca. 1 mm. longis, maturitate separatis basi incrassatis et brunneis; strobilis masculinis solitariis vel glomeratis sessilibus in nodis ramulorum gestis oblongo-ovoideis obtusis obscure tetragonalibus ca. 5 mm. longis 3–4 mm. crassis 12–16-floris, bracteis luteis ovato-orbicularibus ca. 2 mm. longis per partem quartam inferiorem vel paullo ultra connatis apice obtusis vel rotundis margine scariosis; perianthio oblongo-obovato bracteas subsuperanti; columna staminali paullo vel vix exserta; antheris sessilibus 5; galbulis floralibus bifloris solitariis vel glomeratis ad nodos ramulorum sessilibus, bracteis ochroleucis membranaceis ovato-orbicularibus ca. 6 per quartam partem basi connatis, tubillo recto 1.5 mm. longo breviter exserto a limbo obliquo integro terminato; galbulis maturis ellipsoideis 7–8 mm. longis, semine exserto plumbaceo ovato dorse convexo facie plano.—Chile: abundant on hillsides and gravelly benches, Quebrada de Potrerillos above Agua Dulce, Dept. Chañaral, ca. 2600 m. alt., Oct. 22, 1925, *Johnston 3705;* common, Quebrada del Salto below Portezuelo de San Pedrito, Sierra de San Miguel, Dept. Copiapó, ca. 3200 m. alt., Nov. 5, 1925, *Johnston 4865* (type, Gray Herb.).

This species belongs to the section *Pseudobaccatae* and is apparently most closely related to *E. americana* H. & A. It differs from that species, however, in being a very much more robust plant and in having shorter coarser more erect branchlets, leaves more completely connate, more ellipsoid galbuli and apparently fewer anthers. In the coarseness of its twigs *E. Wraithiana* suggests the Argentine, *E. ochreata* Miers, but that species, of course, has ternate leaves and baccate fruit. The proposed species is the common Ephedra in the arid cordilleras east and northeast of Copiapó where it forms large bushes which not infrequently become 2 m. tall and develop a coarse trunk 1–3 dm. thick and as much as a meter in length. Like the other Chilean species of the genus it is known as "Pingo-pingo." In the vicinity of the Potrerillos mines it is used as fuel although it is not considered as desirable as "Barilla" (*Adesmia* spp.) since it produces more smoke in burning. The species is named in honor of Mr. William Wraith of the Andes Copper Company. It is a pleasure to acknowledge here my appreciation of the kindly interest and invaluable help of Mr.

Wraith at the time when I was beginning my botanical work in northern Chile.

Cardamine (?) **cremnophila**, sp. nov., glaberrima; radice perenni longa descendente multicipitali apicem versus 5–12 mm. crassa; caulibus pluribus 5–15 cm. longis ascendentibus simplicibus vel furcatis, infra medium non rariter suffruticosis et subpersistentibus 3–8 mm. crassis evidenter cicatricosis saepe cum vestigiis foliorum subpersistentibus pallidis conspicue ornatis, supra medium foliosis; foliis confertis, laminis late cordatis herbaceis subconcoloribus obtusis integerrimis vel conspicue dentatis 3–6.5 cm. longis 2.5–5.5 cm. latis, petiolis 7–15 cm. longis 2–3 mm. latis; racemis exsertis aphyllis; pedunculis 5–10 cm. longis; pedicellis anthesi 5–10 mm. longis, maturitate ad 2 cm. longis laxe ascendentibus vel plus minusve declinatis gracilibus sed a toro turbinato ca. 2 mm. crasso terminatis; sepalis ovati-oblongis vel elliptico-oblongis 5–6 mm. longis ca. 2 mm. latis apice rotundis margine hyalinis post anthesin deciduis; petalis albis 11–13 mm. longis 5–6 mm. latis, lamina obovata in unguem gracilem longum contracta; filamentis linearibus 6–7 et 7–8 mm. longis; ovario elongato 20–30-ovulato; capsula ca. 3 mm. longa ca. 2 mm. crassa torulosa paullo compressa subtereti 3–4 mm. longe stipitata, valvis nervo medio carinatis; seminibus uniseriatis compressis ca. 1.8 mm. longis cancellatis.—CHILE: locally common in sheltered places about a cliff in the upper part of Quebrada de San Miguel, Sierra de San Miguel, Dept. Copiapó, ca. lat. 27° 25′ S., long. 69° 23′ W., ca. 2700 m. alt., Nov. 8, 1925, *Johnston 4927* (TYPE, Gray Herb.).

A peculiar species apparently without any very immediate relative. I could find no material in the Philippi Herbarium at all like it. It is evidently a perennial, having a strong sparingly branched tap root roughened with prominent warty excrescences which are apparently the nodules of rhizophilous bacteria. The plant grew in slightly moist soil in sheltered niches on a cliff and among rocks in shaded talus. It formed low-domed herbaceous masses 2–3 dm. broad and grew in the company of *Cajophora coronata* H. & A. My guides called it "Yerbo gato." In general appearance the plant is most suggestive of *Cardamine* although it is quite atypical of that genus in its habit of growth. The slightly immature fruit at hand seems to be subterete and to have a strong medial keel on the valves. These characters suggest *Nasturtium* although the habit of the plant, its large flowers and uniseriate seeds are more at variance with that genus than with *Cardamine*. I suspect that when fully mature fruit of *Cardamine cremnophila* is available the plant will prove to be worthy of special generic recognition.

Hexaptera macrocarpa, sp. nov., pilosa fusco-viridis 1–2 dm. alta; caulibus pluribus foliosis ascendenter ramosis 1–2.3 mm. crassis e radice crassa orientibus; foliis integerrimis concoloribus 1–1.5 cm. longis 2–6 mm. latis saepe oblanceolatis sed rariter ad formam plus minusve oblongo-obovatam variantibus supremis non rariter ellipticis, apice obtusis callosis, ad basem versus attenuatis; racemis simplicibus terminalibus 5–10 cm. longis 2–3 cm. crassis multifloris; pedicellis gracilibus 8–16 mm. longis stricte ascendentibus; sepalis oblongis ca. 4 mm. longis et 1.5 mm. latis margine hyalinis apice rotundis dorso pubescentibus; petalis pallide flavescentibus ca. 5 mm. longis 1.5–2 mm. latis quam sepalis evidenter longioribus, lamina ovata longe unguiculata; siliculis circumscriptione late elliptico-orbicularibus 10–12 mm. longis 9–11 mm. latis, valvis purpurascentibus ellipticis 5–6 mm. longis ca. 4 mm. latis compressis conspicuissime alatis, alis hyalinis 2–3 mm. latis; dissepimento lineari 8–10 mm. longo.—CHILE: diluvial gravel just below Laguna de Valeriano, Dept. Vallenar, ca. 3900 m. alt., Jan. 8, 1926, *Johnston 6058* (TYPE, Gray Herb.).

Growing in the compact diluvial outwash which fills Quebrada de Valeriano just below Laguna de Valeriano. It was seen at no other place and was much less common there than its congener, *H. cuneata* Gill. & Hook., with which it grew. The new species seems to be related to *H. spathulata* Gill. & Hook. and to *H. Jussiaei* Barn. The former species, which is known only from the cordilleras between Mendoza and Santiago, also has entire oblanceolate leaves but differs from our plant in having much smaller very much more narrowly winged fruit and a suffruticose much less diffuse habit. *Hexaptera Jussiaei* differs in its cuneate tridentate leaves and smaller fruit. It is very unlikely that *H. macrocarpa* could be a form of *H. Jussiaei* since that species is represented in the region about Laguna de Valeriano by the northern geographic phase which has been described by Philippi as *H. tridentata*.

Astragalus valerianensis, sp. nov., perennis ca. 3 dm. altus sparsissime strigosus; caulibus erectis vel stricte ascendentibus ramosis internodiis 2–6 cm. longis; rhachi folii 4–6 cm. longa per tertiam partem vel fere ad medium nuda, foliolis suboppositis 5–8-jugis oblongis vel ellipticis 1–1.8 cm. longis 1.5–5(–6) mm. latis apice obtusis vel emarginatis 0.4–0.8 mm. longe petiolulatis; stipulis 4–6 mm. longis ultra medium (2.5–4 mm. longe) connatis membranaceis inconspicue ciliatis; pedunculis erectis vel stricte ascendentibus rectis 8–13 cm. longis quam foliis duplo vel subduplo longioribus; bracteis persistentibus obovatis vel oblongis acutis 1–2 mm. longis; floribus

laxe racemosis 2–3 mm. longe graciliter pedicellatis; tubo calycis campanulato 2.5–3 mm. longo sparse strigoso basi rotundato, lobis calycis triangularibus inaequilongis ca. 1 mm. longis inconspicue ciliatis; vexillo oblongo-obovato ca. 9 mm. longo fere ad 6 mm. lato paullo reflexo, lamina in unguem latum brevem paullatim angustata apice rotunda saepe emarginata medium versus ochroleuca aliter purpurea; alis carinam conspicue superantibus, laminis oblongis 5–6 mm. longis ca. 2.5 mm. latis ad basem versus purpureis alibi ochroleucis, unguibus linearibus ca. 3.5 mm. longis; carina oblonga ca. 3 mm. longa apice obtusa, lamina oblonga ca. 3 mm. longa ad apicem versus purpurea alibi ochroleuca, ungue lineare ad 3 mm. longo; ovario glaberrimo anguste lanceolato compresso breviter stipitato; leguminibus ellipsoideis valde inflatis magnis 4–4.5 cm. longis ca. 2.5 mm. crassis sessilibus pendulis 4–4.5 mm. longe pedicellatis chartaceis saepe purpureo-tinctis glaberrimis; seminibus brunneis ca. 4 mm. longis oblique ovatis compressis laevibus.—CHILE: loamy talus along the Rio de Valeriano near La Cueva, Dept. Vallenar, ca. 2800 m. alt., Jan. 8, 1926, *Johnston 6033* (TYPE, Gray Herb.).

This species which belongs to the section *Phaca* is characterized by its very long strict peduncles, very large pendulous legumes and small purple corollas. I saw it only once. It formed a very large and populous colony on a talus slope and on the adjacent floor of the quebrada of the Rio de Valeriano a short distance below La Cueva. I was quite unable to match my specimens of it in the Philippi Herbarium at Santiago.

Cristaria glomerulata, sp. nov., abundanter glandulifera ut videtur perennis; caulibus decumbentibus vel laxe ascendentibus 1–3 dm. longis laxe ramosis pilis brevibus simplicibus glanduliferis dense obsitis et pilis stellatis minutis sparse ornatis, internodiis 1–3 cm. longis; foliis ad apicem versus caulis paullo reductis; lamina folii firmiuscula ambitu suborbiculata vel ovato-orbiculata usque ad medium in lobos 3–7 inaequales plus minusve abundanter evidenterque dentatos vel subpinnate lobulatos palmatifida pilis stellatis sparsis adpressis vestita sparse glandulifera basi reniformi vel truncata subtus paullo pallidiori vel plus minusve purpureo-tincta; petiolo quam internodiis adjacentibus et lamina saepe evidente longiori dense glandulifero sparsissime stellato-pubescenti; floribus rariter solitariis saepius glomeratis; glomerulis 5–10-floris ca. 1 cm. diametro 3–10 mm. longe pedunculatis foliis adjacentibus distincte brevioribus; pedicellis gracillimis glanduliferis calycem saepe brevioribus axillis bractearum ovatarum lanceolatarumve 1–2 mm. longarum glanduliferum erumpentibus; calyce ad anthesim ca. 4 mm. longo glandulifero pilis

simplicibus et stellatis vix adpressis villoso, lobis oblongis vel ovatis saepe obtusiusculis apicem versus glabrescentibus et herbaceis; petalis purpurascentibus 3–4 mm. longis sepalis aequilongis; carpellis 10–15 glabratis alis ovatis 2 mm. longis aequilongis.—CHILE: gravelly open soil near Potrerillos, Dept. Chañaral, ca. 2800 m. alt., Oct. 24–26, 1925, *Johnston 4725, 4744* (TYPE, Gray Herb.).

A very distinct species belonging to the group of glanduliferous plants containing *C. glandulosa* Ph., *C. inconspicua* Ph. and *C. multiflora* Gay. It is, however, quite distinct from these species being most closely related to *C. multiflora* from which it differs greatly in leaf-outline, habit, etc. In Reiche's treatment of the genus, Fl. Chile i. 243 (1896), it keys out with *C. glandulosa*, from which it differs in its smaller petals, very glandular stems and petioles, different inflorescence as well as much more northern range.

Euphrasia adenonota, sp. nov., annua minima erecta 1–3 cm. alta simplex vel rariter brevissimeque ramosa brevissime albo-hirsutula purpureo-tincta gracillima; cotyledonibus persistentibus glaberrimis obovatis; foliis crassiusculis trilobatis 2–5 mm. longis, margine valde revolutis et incrassatis, subtus dense glanduliferis cum costa lata incrassata cuneiformi eglandulosa evidenter notatis, supra (praesertim marginem versus) hirsutulis, lobis ovatis vel ellipticis obtusis vel rotundis integris, mediali longissimo; floribus 1–3 in axillis foliorum superiorum maximorum gestis; calyce 2–3 (maturitate ad 4) mm. longo ad medium versus lobato sparse hirsutulo basem versus in pedicellum 1–2 mm. longum gradatim contracto, lobis oblongis vel elliptico-oblongis margine revolutis apice obtusis vel rotundis; corolla 4–4.5 mm. longa subcylindrica calycem 1–2 mm. longe superante glabra, lobis superioribus paullo longioribus rectis 1 mm. longis oblongis obtusis integris, lobis inferioribus ascendentibus; antheris glabris suberectis, loculis calcaratis; capsula late obovata compressa inclusa glaberrima.—CHILE: moist silt and peat in a vega at the head of Laguna de Valeriano, Dept. Vallenar, 4000 m. alt., Jan. 9, 1926, *Johnston 6067* (TYPE, Gray Herb.).

This interesting little plant belongs to the section *Trifidae* and finds its closest relatives in *E. perpusilla* Ph. [cf. Skottsberg, Zur Gefässpfl. Westpatag. 19–21, fig. 3, (1923)] and *E. antarctica* Benth. It is, however, quickly separable from these annuals by its very small size, broad calyx-lobes, glanduliferous lower surfaces of the leaves and very broad thickened ribs of the leaves. In addition it differs from *E. perpusilla* in producing short stiff white hairs on the leaves and calyx and in having less revolute leaves. From *E. antarctica*, in particular, it differs in its simple or subsimple habit, and in its less deeply and more broadly lobed leaves.

Clos, in Gay's Flora de Chile, v. 146 (1849), reports *E. antarctica* from the Cordillera de Hurtado in the department of Ovalle. According to notes kindly furnished me by Dr. F. W. Pennell this record is based upon material referable to *E. adenonota*, for there is a collection of it in the museum at Santiago made by Gay (no. *1090*) in Jan. 1837 and labeled as obtained "in andibus humidis, Hurtado, Coquimbo, alt. 3000 m." This collection is associated with a manuscript name that has never been published. Wettstein, Monog. Euphr. 279–80 (1896), cites a collection from the Andes of Illapel which he doubtfully refers to *E. antarctica*. This collection perhaps may also represent *E. adenonota*. My collection from Laguna de Valeriano comes about 180 km. to the north of the locality where Gay collected the species and consequently sets the northern limit, as now known, for the genus in South America. The plant was locally abundant in the large meadow at the upper end of Laguna de Valeriano where I found densely crowded colonies in peat or in tufts of moss or in the silt between the large cushions of *Oxychloe*. The plants are stained with purplish. The corolla is white and is striped down each lobe with red-purple.

Senecio pelolepis, sp. nov., discoideus perennis suffruticosus coactis densissimis candidis vestitus; radice valida; caulibus vetustioribus laxe ascendentibus vel decumbentibus; caulibus junioribus erectis simplicibus 10–18 cm. longis numerosis obscure angulatis basem versus 1.5–2(–3) mm. crassis ad apicem capitula 1–3 laxe disposita 1–4 cm. longe pedunculata gerentibus; foliis strictis oblongis 8–16 mm. longis 2–4 mm. latis concoloribus supremis paullo reductis apice obtusis vel rotundis margine paullo revolutis integerrimis vel distincte irregulariterque sparsi-dentatis -lobulatisve; pedunculis strictis saepe inconspicue bracteolatis; capitulis campanulatis ca. 1 cm. longis 6–7 mm. crassis erectis basi cum bracteis ca. 6 ovatis vel lanceolatis 2–4 mm. longis calyculatis; tegulis 1–2 mm. latis flosculis paullo brevioribus ca. 13 atratis arachnoideis mox glabrescentibus margine anguste hyalinis apice triangularibus plus minusve squarrosis; receptaculo plano alveolato marginibus alveolorum angustis elevatis plus minusve erosis; flosculis homomorphis tubulosis hermaphroditis 40–50 luteis 8–9 mm. longis glaberrimis, dentibus 0.6–0.7 mm. longis triangularibus vesiculosis incrassatis apice incurvis; filamentis ca. 3 mm. longis 0.5–0.7 mm. infra apicem valde expansis et in texturam vesicularem abrupte transmutatis deinde apicem versus gradatim attenuatis; antheris 2.4–2.7 mm. longis cum appendicula ad 0.5 mm. longa triangulari-ovata coronatis; stylo glaberrimo 8–9 mm. longo in lobos ad 1.5 mm. longos lineari-oblongos summam ad apicem ciliatos

divisis; achaeniis glaberrimis costatis.—CHILE: gravelly bench at Junta del Medio, upper Rio de la Carmen, Dept. Vallenar, lat. 29° 22′ S., long. 70° 5′ W., 2900 m. alt., Jan. 16, 1926, *Johnston 6220* (TYPE, Gray Herb.); dry gravelly bench below Los Cuartitos, upper Rio de la Carmen, Dept. Vallenar, 3300 m. alt., Jan. 17, 1926, *Johnston 6231*.

This species is related to *S. leucus* Ph. from which it differs in its very much firmer and denser chalky-white tomentum, in its smaller heads borne solitary or in groups of 2 or 3, and in the very dark colored involucre. The plant forms a loose unkempt white bush 3–6 dm. tall. My material from near Los Cuartos has been disturbed by cattle and shows numerous erect leafy stems springing directly from a very dense low caudex.

Senecio tinctolobus, sp. nov., perennis humilis griseo-tomentosus discoideus; caulibus numerosis herbaceis erectis vel decumbentibus 2–4 cm. longis simplicibus e caudice fruticuloso erumpentibus, internodiis 1–5 mm. longis; foliis alternis ascendentibus oblanceolatis vel spathulato-oblongis 5–12 mm. longis 2–5 mm. latis in lobulos vel dentes 0.5–1 mm. latos 0.1–1.5 mm. longos oblique incisis vel rariter integerrimis concoloribus crassiusculis enervatis ad basem versus attenuatis et in partem petioliformem paullo differentiatis plus minusve late affixis margine paullo revolutis; capitulis campanulatis erectis terminalibus solitariis 0.5–1(–1.5) cm. longe pedunculatis folia evidenter superantibus 12–15 mm. longis 11–13 mm. crassis, basi cum bracteis 8 subulatis 3–7 mm. longis erectis calyculatis; tegulis 18–22 erectis flosculis subaequilongis arachnoideis et cinerascentibus deinde glabratis et viridescentibus apice acutis margine anguste hyalinis; receptaculo plano alveolato marginibus alveolorum integris glabris; flosculis homomorphis tubulosis hermaphroditis 8–9 mm. longis glaberrimis ca. 120, tubo flavo ca. 3.5 mm. longo, faucibus elongatis flavis, lobis triangularibus incrassatis vesiculosis ca. 0.5 mm. longis rubiginosis apice incurvis; filamentis glabris ca. 0.75 mm. infra apicem valde expansis et in texturam vesicularem abrupte transmutatis deinde apicem versus gradatim contractis; antheris 2.3–2.5 mm. longis cum appendicula ovato-oblonga ca. 0.4 mm. longa coronatis; stylo glaberrimo in lobos 1.3–1.4 mm. longos oblongo-lineares summum ad apicem ciliatos diviso; achaeniis ca. 12-costatis glaberrimis ca. 4 mm. longis elongatis.—CHILE: common on rocky slopes above Laguna de Valeriano, Dept. Vallenar, ca. 4000 m. alt., Jan. 9, 1926, *Johnston 6072* (TYPE, Gray Herb.).

This species falls in group xii of the discoid species as defined by Reiche, Fl. Chile iv. 220 (1905). The leaves are very variable in

outline ranging from entire or sparsely dentate to deeply lobed, being sometimes cleft half way to the midrib. The tomentum is grayish and close, though it thoroughly covers the stems and leaves it is not particularly thick. The florets are yellow with the lobes reddish brown.

Polyachyrus rigidus, sp. nov., fruticosus 3–6 dm. altus prope basem ramosissimus; caulibus erectis rigidis foliosis glabris stipitato-glandulosis 1–3 dm. longis; foliis rigidis firmis pinnatifidis stipitato-glandulosis apicem versus caulis reductis subtus pallidioribus juventate evanescenter inconspicueque tomentellis margine paullo revolutis, inferioribus late oblanceolatis 5–6 cm. longis 1–1.5 cm. latis ad basem versus in petiolum anguste (0–1 mm. late) alatum vix auriculatum attenuatis, medialibus oblongis 3–5 cm. longis 1.5–2 cm. latis sessilibus basi in auriculas amplexicaules 3–4 mm. latas evidenter productis, lobulis subovatis angulatis dentatis vel angulate lobulatis, apicibus lobulorum dentiumque acutis vel submucronatis neque acuminatis neque spinescentibus; glomerulis capitulorum 2–3 laxe cymosis ca. 1.3 mm. diametro subglobosis 0.5–2(–5) cm. longe pedunculatis; pedunculo bracteis foliaceis 0.5–1.5 cm. longis ornato; receptaculo glomeruli subgloboso tomentoso; bracteis 5 mm. longis rigidis firmis anguste lanceolatis glanduligeris; involucris flosculorum 2-floris ca. 5 mm. longis; tegulo exteriori ceteris subaequilongo glandulifero infra medium callo prominenti saepe incrassato; flosculis albis ca. 9 mm. longis, tubo (faucibus vix differentiatis) ca. 4 mm. longo extus inconspicue glanduloso, labia interiori in lobos 2 lineares 3.5 mm. longos divisa, labia exteriori 3.7 mm. longa 1.9 mm. lata apice tridentata, filamentis ca. 2 mm. longis; antheris (partibus polleniferis) ca. 1.8 mm. longis appendicula ca. 1.6 mm. longa coronatis basi caudis 1.8 mm. longis ornatis; setis pappi 5–6 mm. longis.—CHILE: a glandular oily bush growing about rocks on a dry hillside below Agua Dulce, Quebrada de Potrerillos, Dept. Chañaral, ca. 2550 m. alt., Oct. 22, 1925, *Johnston 4700* (TYPE, Gray Herb.).

This species is probably most closely related to *P. latifolius* Ph. from which it differs in being a more compact shrubby plant and in having smaller firmer more glandular less sharply toothed or lobulate leaves of which the lower ones completely lack auriculate bases. From *P. carduoides* Ph. it differs in having leaves with the under surfaces nearly glabrous and the margins lacking spinescent or acuminate teeth.

Pachylaena rosea, sp. nov., glaberrima paullo glaucescens; caulibus subterraneis e radice crassa valida perenne erumpentibus; foliis apice caulis in superficie humi rosulatis congestis pallide virides-

centibus concoloribus vetustate rubicundis lamina orbiculata vel reniformi 2–4 cm. longa et lata denticulata in petiolum alatum 1–2 cm. longum 3–8 mm. latum abrupte contracta; capitulis campanulatis vel campanulato-hemisphaericis 1.5–4 cm. crassis 2–3 cm. longis e rosulis foliorum orientibus primo aspectu sessilibus sed vere 5–15 mm. longe pedunculatis pedunculo inter folios occulto; involucro infra medium cupuliformi et vix lobato, lobis erectis imbricatis partibus superioribus denticulatis; lobis involucri interioribus 15–20 cuneato-oblongis vel ligulatis saepe pallide rubescentibus flosculos disci 2–5 mm. longe superantibus, ceteris oblongis vel ovatis distincte breviboribus irregulariter 2–3-seriatis aliis basi bractearum interiorum subregulariter 1–2-seriate affixis aliis paucis basem versus involucris irregulariter dispersis; receptaculo concavo vel latissime concavo-infundibuliformi scrobiculato exappendiculato; flosculis exterioribus 15–20 evidenter ligulatis roseis 2.3–2.8 cm. longis pistilliferis sed cum loculis antherarum abortivis quamobrem incompletis achaenia abortiva gestis in partibus lateralibus involucri cupuliformis (? i. e. margine erecto receptaculi) 2–5 mm. supra basem affixis, limbo 1.5–2 cm. longo 2–3 mm. lato erecto bracteas interiores involucri paullo vel vix superanti apice integro vel inconspicue 2–3-dentato; flosculis disci hermaphroditis perfectis 50–100 flavis ca. 1.5 mm. longis, tubo (faucibus vix differentiatis) ad 1 cm. longo, labia exteriori ligulata ad 5 mm. longa tridentata revoluta, labia interiori in lobos 2 filiformes ad 4 mm. longos revolutos divisa; pappi setis ca. 14 mm. longis albis eleganter plumosis biseriatis numerosis; achaeniis 10–12 mm. longis 2–3 mm. crassis stramineis costatis.—CHILE: local on talus near Potrero de Toledo, Rio de la Laguna Grande, Dept. Vallenar, 2660 m. alt., Jan. 5, 1926, *Johnston 5897* (TYPE, Gray Herb.).

Obviously a close relative of *P. atriplicifolia* Don from which it differs in having the ray-florets conspicuously cerise or rose-colored, the smaller heads narrower and denser, and the undivided lower part of the involucre deeper and very sparingly provided with bracts outside. The plant was seen only once. It grew on a gravelly slope near the trail about opposite Potrero de Toledo at ca. 2600 m. alt. This altitude is lower than that frequented by *P. atriplicifolia* for in the same watershed I observed it down only to ca. 3200 m. alt.

II. SOME UNDESCRIBED SPECIES FROM PERU.

Linum parvum, sp. nov., annuum erectum herbaceum 4–9 cm. altum; caule solitario fere ad apicem simplici deinde laxissime sparseque cymoso-ramoso striato 0.5 mm. crasso minute stipitato-glandulifero; foliis paucis oblanceolatis vel linearibus 5–10 mm. longis 1.5–2

mm. latis costatis sed enervatis integerrimis acutis sparse glanduliferis, basi attenuatis glandulis 2 majusculis brunneis globosis ornatis, caulinis oppositis internodiis longioribus, rameis (i. e. bracteis) alternis oppositifloris; floribus in apice caulis solitariis vel in cymas unilaterales simplices vel non rariter dichotomas saepe 3–6-floras dispositis; pedicello 0.3–0.9 mm. longo; sepalis 3- vel rariter 5-nervatis late lanceolatis integris 3(–5) mm. longis, apice herbaceis et recurvatis in facei interiori sparse pubescentibus; petalis flavis 4.5–5 mm. longis 1.5 mm. latis oblongo-oblanceolatis sepalis fere duplo longioribus apice rotundis vel emarginatis; staminibus ad 0.5 mm. longe connatis stylum vix superantibus; stylis ca. 2.5 mm. longis infra medium plus minusve connatis glabris; stigmate capitato; capsulis globosis 3–3.5 mm. diametro minute stipitato-glanduliferis supra medium badiis; seminibus 1.5 mm. longis 1.1 mm. latis nitidis fulvis sublaevibus.—PERU: local on dryish sandy places at lower edge of fertile belt in hills directly back of Mollendo, Dept. Arequipa, Oct. 16, 1925, *Johnston 3549* (TYPE, Gray Herb.).

A small-flowered annual herb of the Loma Formation of which the exact relationship is uncertain. It differs from the other species of western South America in being herbaceous and short-lived and in the inconspicuous though abundant stipitate glands which cover the stem.

Eremocharis confinis, sp. nov., suffruticosa decumbens ramosissima glaberrima; caulibus dichotome ramosis flexuosis, internodiis 1–5 cm. longis; ramis foliatis 3–15 cm. longis 1–2 mm. crassis; foliis alternis crassiusculis concoloribus, petiolo elongato paullo compresso saepe 1.5–2 cm. longo ad 1 mm. crasso lamina circa duplo longiori basi paullo dilatato subamplexicauliter affixo, lamina biternate dissecta ambitu deltoidea 8–12 mm. lata, lobis 3 divaricatis subaequilongis linearibus fere ad 1 mm. crassis, lobulis usque ad 3 mm. longis non rariter dentatis; umbellis compositis, pedunculo primario 1.5–3 cm. longo, radiis 3–4 apicem versus paullulo attenuatis fructu delapso persistentibus (5–)12–25 mm. longis imam ad basem bracteis oblongis 1–2 mm. longis ornatis, umbellulis densis 6–7 mm. diametro usque ad 12-floris, bracteolis 4–7 oblongis vel lanceolatis 1–2 mm. longis; pedicellis gracilibus ad 1 mm. longis; petalis viridescentibus, lamina primaria orbiculari vel obovata ca. 1 mm. lata breviter lateque ca. 0.4 mm. longe unguiculata, apice inflexo cuneato parti primariae aequilongo; sepalis 0.3–0.5 mm. longis triangularibus apice acutis acuminatisve erectis; filamentis subulatis 2 mm. longis; antheris 1 mm. longis; fructu 2 mm. longo angulato; mericarpiis dorse leviter concavis laevibus margine acutis sed vix alatis, facie commissurali

sulcata intrusa.—PERU: Candarave, Dept. Tacna, ca. 2950 m. alt., March, 1925, *Weberbauer 7369* (TYPE, Field Mus.).

Characterized by its decumbent habit and long-petioled sparsely lobed leaves. It is probably most closely related to **Eremocharis triradiata**, comb. nov. (*Asteriscium triradiata* Wolff) from the Cusco region but differs in neither being at all spinescent nor having fasciculate leaves and purple flowers. Cf. supra pg. 90.

Eremocharis dissecta, sp. nov., frutescens 1 m. alta supra medium ramosissima; ramis teretibus subtiliter striatis laxe dichotomeque ramosis, internodiis 2–4 cm. longis; foliis alternis dissectis trifoliolatis crassiusculis concoloribus ambitu deltoideo-ovatis; petiolo 2–3 cm. longo paullulo compresso; foliola terminali 5–10 mm. longe petiolulata 8–12 mm. longa cuneato-obovata cum apice dentata vel saepissime ambitu quadrangulata et trifoliolata vel irregulariter lacerata; foliolis lateralibus usque ad 5 mm. longe petiolulatis saepe irregulariter lacerato-dissectis et in lobulos angustos divergentes sectis; umbellis compositis 1–4 cm. longe pedunculatis; radiis 4–12 mm. longis geminatis ternatisve fructu delapso subpersistentibus imam ad basem bracteis 1–2 inconspicuis usque ad 1 mm. longis ornatis; umbellulis ca. 12-floris 6–8 mm. diametro bracteolis oblongis lanceolatisve pluribus 0.5–1 mm. longis ornatis; pedicellis gracillimis 2–3 mm. longis; petalis albis, lamina primaria suborbiculari ca. 1 mm. diametro brevissime unguiculata, apice ligulato-attenuato inflexo parti primariae subaequilonga; sepalis ovato-deltoideis acuminatis erectis persistentibus ca. 0.25 mm. longis; filamentis subulatis 1.2 mm. longis; antheris orbicularibus ca. 0.8 mm. longis; mericarpiis 1.5 mm. longis prismaticis dorso planis vel leviter concavis margine angulatis sed vix alatis facie commissurali sulcata in semen intrusa; stylopodiis compressis a stylis linearibus ascendentibus coronatis.—PERU: Cerro del Muerto near La Brea, Dept. Piura, ca. 750 m. alt., March 16, 1927, *Weberbauer 7761* (TYPE, Field Mus.).

Related to **Eremocharis longiramea**, comb. nov. (*Asteriscium longiramcum* Wolff) from Ancash, but differing in its more dissected leaves, smaller bracts and shorter and fewer umbel-rays.

Nolana plicata, sp. nov., ut videtur prostrata abundanter breviterque glanduloso-villosa; partibus plantae inferioribus ignotis; ramis fistulosis herbaceis usque ad 4 mm. crassis, internodiis 2–4 cm. longis; ramulis ascendentibus usque ad 1 dm. longis gracilibus 1–1.5 mm. crassis, internodiis 5–18 mm. longis; lamina folii lanceolata vel anguste ovata 2–3 mm. longa 7–15 mm. lata crassiuscula inconspicue pinnato-nervata apice acuta ad basem versus in petiolum 6–10 mm. longum alatum gradatim attenuata margine anguste revoluta integer-

rima subtus paullo pallidiori; floribus in axillis foliorum solitariis; pedicellis gracilibus 1–2 cm. longis erectis, fructiferis paullo robustioribus deflexis; calycibus ca. 15 mm. longis pentangulatis evidenter plicato-carinatis, tubo campanulato 8–9 mm. longo 9–10 mm. lato, lobis triangularibus ca. 7 mm. longis 5–7 mm. latis; corolla ca. 3 cm. longa extus sparse villosa quam calyce duplo vel triplo longiori, tubo ca. 5 mm. longo ca. 2.5 mm. crasso per calycem occulto intus dense villoso, faucibus subcampanulatis ca. 21 mm. longis ca. 15 mm. crassis, lobis ca. 4 mm. longis rotundis ascendentibus; filamentis 6 et 9 mm. longis subulatis 5–6 mm. supra basem corollae affixis; stylo glaberrimo ca. 15 mm. longo; fructu ca. 10 mm. diametro ca. 5 mm. alto 3–5-lobato maturitate in nuculos 3–5 inaequales disrumpente; nuculis dorso valde convexis rugosis brunneis, ad apicem versus carinatis, ventrale subplanis non rariter angulatis cicatrice granda albida conspicue notatis.—PERU: Atiquipa, Prov. Camaná, Dept. Arequipa, ca. 270 m. alt., Nov. 1915, *Weberbauer 7190* (TYPE, Field Mus.).

The nutlets in *N. plicata* have a nearly plane, almost vertical commissural face which is almost completely occupied by the pale attachment scar. The base of the nutlets is very strongly convex and irregularly rugose. Towards the summit there tends to be a rather definite carina developed. The fruit is quite dry and bony. The calyx is strongly angulate by pronounced plications extending down each calyx-lobe in a manner very suggestive of many species of *Mimulus*.

Bargemontia platyphylla, sp. nov., annua herbacea villosa 1–1.5 dm. alta; caulibus pallidis villosis simplicibus vel saepissime imam ad basem ramosis et in ramos plures elongatos simplices vel sparse breviterque ramosos ascendentes vel decumbentes dissolutis, internodiis 2–6 cm. longis; foliis carnosulis concoloribus sparse villosis, laminis foliorum lanceolatis vel lanceolato-ovatis acutis integerrimis obscure pinnatinervatis, medio-caulinis 2–2.5 cm. longis 7–10 mm. latis ad basem versus in petiolis 5–10 mm. longos saepe anguste alatos contractis, superioribus gradatim reductis basalibus longe petiolatis evanescentibus; floribus in axillis foliorum solitariis; pedicellis gracillimis villosis 2–10(–15) mm. longis ascendentibus, maturitate paullo incrassatis arcuate deflexis; calyce ad anthesim 8–10 mm. longo villoso herbaceo, tubo cupulato 2–3 mm. longo 2–2.5 mm. crasso, lobis lanceolatis acuminatis ca. 7 mm. longis paullo inaequalibus erectis; calyce fructifero accrescenti 5–8 mm. diametro; corolla ca. 10 mm. longa caerulescenti (in sicco aurantiaca) lobos calycis paullo vel vix superante extus sparse villosa intus glaberrima, tubo ca. 2 mm. longo ad 2 mm. crasso, faucibus 6 mm. longis ad apicem versus gradatim

ampliatis apice ca. 8 mm. diametro, lobis 2 mm. longis 3 mm. latis rotundis ascendentibus; antheris 2 et 3 mm. longis glaberrimis inclusis; nuculis ovoideis ca. 2 mm. longis ca. 10 basi affixis; receptaculo lobato.—PERU: hills southeast of Moquegua, Prov. Moquegua, ca. 1550 m. alt., March 22–24, *Weberbauer 7455* (TYPE, Field Mus.; ISOTYPE, Gray Herb.).

A very distinct species quickly recognized by its broad leaves and annual herbaceous habit. There are only two other distinctly annual species in the genus. These are *B. aplocaryoides* (Gaud.) Johnston (= *Alona pusilla* Ph.) of the coastal region of the Prov. of Antofagasta, Chile, and *B. gracillima* Johnston from the same region as the present new species.

Bargemontia gracillima, sp. nov., annua herbacea sparse inconspicueque villosula erecta 1–1.5 dm. alta; caule subtereti gracili ascendenter ramosissimo pallido pustulato, internodiis 5–30 cm. longis; foliis linearibus vel anguste spathulato-linearibus ascendentibus vel patentibus 1–2.5 cm. longis 0.8–1.5 mm. latis carnosulis compressis glabratis pustulosis apice obtusis ad basem versus attenuatis; floribus in axillis foliorum solitariis; pedicellis gracillimis 5–13 mm. longis glabris vel sparsissime villosulis maturitate abrupte reflexus; calycibus ad anthesim 4–6 mm. longis glabris vel sparsissime villosulis, tubo breviter cylindrico 2.5–3 mm. longo 1–1.5 mm. crasso, lobis subulatis acutis erectis inaequalibus basem vel fere ad medium faucium attingentibus; calycibus fructiferis distentis, tubo cupulato 2.5–3.5 mm. crasso 1–1.5 mm. alto, lobis ascendentibus vel recurvis; corolla violacea graciliter infundibuliformi 10–12 mm. longa extus sparse puberulenta, tubo ca. 3.5 mm. longo intus villoso, faucibus ca. 7.5 mm. longis intus glaberrimis, lobis ovatis 2–2.5 mm. longis ascendentibus; filamentis ca. 3.5 mm. supra basem corollae affixis 4 et 6 mm. longis ad basem versus sparsissime villosulis; nuculis ca. 5 nigris uniseriatis evidentibus crasse ovoideis 1.5–2 mm. longis basi affixis.—PERU: hills southeast of Moquegua, Prov. Moquegua, ca. 1550 m. alt., March 22–24, 1925, *Weberbauer 7457* (TYPE, Field Mus.; ISOTYPE, Gray Herb.).

This species is most closely related to *B. platyphylla* Johnston, differing in being more slender throughout and in having a very sparse and obscure pubescence, a corolla about twice as long as the calyx and very slender linear leaves. The species is a very distinct one.

Bargemontia confinis, sp. nov., fruticosa laxe decumbens canescens sparse arachnoideo-lanosa ramosissima eglandulosa; ramis vetustioribus caudicem fruticosum prostratum ramosum formantibus saepe cum fasciculis foliorum marcescentium ornatis e radice perenni profunda valida erumpentibus; ramis juventate foliosis fruticulosis

gracilibus ascendentibus 5–15 cm. longis 0.7–1.5 mm. crassis pallidis, internodiis 3–15 mm. longis; ramulis rariter elongatis plerumque ad axillas foliorum ramorum fasciculos foliorum densos formantibus; foliis carnosulis compressis linearibus vel lineari-spathulatis obtusis 3–10(–20) mm. longis 1(–2) mm. latis; floribus in axillis foliorum ramorum solitariis; pedicellis gracillimis 9–18 mm. longis stricte ascendentibus, fructiferis decurvatis paullo robustioribus; calyce ad anthesim 4–5 mm. longis, tubo cupulato ca. 2 mm. crasso, lobis erectis lanceolatis inaequalibus 2–3 mm. longis; calyce fructifero expandente ca. 4 mm. diametro, lobis erectis vel ascendentibus; corolla violacea infundibuliformi 15–17 mm. longa extus glabrata intus glaberrima calyce duplo vel triplo longiori, tubo 3–4 mm. longo subcylindrico, faucibus ca. 10 mm. longis apicem versus dilatatis ad 10 mm. diametro, lobis ascendentibus rotundis 2–3 mm. longis; filamentis ca. 4 mm. supra basem corollae affixis glaberrimis 3 et 5 mm. longis; nuculis 3–5 uniseriatis subglobosis vel subangulatis ca. 2 mm. crassis tuberculatis nigris oblique subbasaliterque affixis.—PERU: with scattered herbs and *Cereus*, Candarave, Dept. Tacna, ca. 2950 m. alt., March 11–13, 1925, *Weberbauer 7382* (TYPE, Field Mus.; ISOTYPE, Gray Herb.).

A well marked species characterized by its large corollas (which are glabrous on the tube within), fasciculate leaves, sparse arachnoid-lanose eglandulose indument and tuberculate nutlets.

Cacabus flavus, sp. nov., annuus prostratus herbaceus glanduliferus sparse villosulus; foliis cordatis 2.5–5.5 cm. latis 3–6 cm. longis conspicue palmato-pinnate nervatis sparse breviterque villosis concoloribus margine integerrimis vel obscure undulatis basi obliquis inaequilateralibus cordatis vel reniformibus, costa dorsaliter arcuata; petiolis 3–9 cm. longis glanduliferis; pedicellis axillaribus erectis 0.8–1.5 mm. longis (maturitate 1–2 cm. longis) glanduliferis; calycibus 9–11 mm. longis breviter villosis glanduliferis campanulatis in lobos anguste triangulares 4–5 mm. longos erectos breviter ciliatos paullo inaequilongos lobatis; corolla flava infundibuliformi gradatim ampliata 2–4 cm. longa 1.5–2.5 cm. diametro, limba vix explanata breviter lateque lobata extus inconspicue villosula, tubo 3–5 mm. longo 2–3 mm. crasso cylindrico per calycem occulto intus basibus decurrentibus incrassatis villosis filamentorum longitudinaliter 5-costato; staminibus 5 inaequalibus corolla 2–3-plo brevioribus, filamentis filiformibus glabratis vel sparsè villosulis summam ad apicem tubi corollae affixis, uno brevi 2–3 mm. longo, duobus lateralibus 3–4 mm. longis et duobus 8–9 mm. longis; antheris linearibus 5–6 mm. longis bilocularibus consimilibus; stigmate subcapitato, stylo filiformi stamina breviter

superanti; capsula globosa glaberrima subnitenti per calycem investita ca. 8 mm. diametro.—PERU: open rocky slopes, Tiabaya, Dept. Arequipa, ca. 2050 m. alt., April 8, 1925, *Pennell 13066* (TYPE, Gray Herb.); dry ravines in hills southeast of Moquegua, Dept. Moquegua, ca. 1550 m. alt., March 22–24, 1925, *Weberbauer 7459* (FM.).

This species belongs to the group of *C. maritimus*, having the mature calyx tightly investing (and finally ruptured by) the fruit. The calyx is membranaceous, not at all inflated, and is marked only by ten very weak ribs. It is readily separated from the known species of the genus by its bright yellow corolla. To judge from the meager description and figure of *C. integrifolius* Ph., from northern Chile, that species must be closely related. The new species differs, however, in its large yellow flowers and in the form of the corolla and calyx.

Salpiglossis albiflora, sp. nov., annua herba 1–2.5 dm. alta gracilis sparse stricteque ramosa glaberrima vel paullo inconspicueque villosula non rariter plus minusve glandulifera; foliis integerrimis enervatis, basalibus anguste oblanceolatis vel spathulato-linearibus 1–6 cm. longis crassiusculis apice rotundis, caulinis linearibus erectis medialibus saepe 0.5–1.5 rariter ad 3 cm. longis supremis valde reductis; pedicellis gracilibus 1–3 cm. longis ascendentibus axillaribus et quasi terminalibus; calycibus evidente irregularibus 5–6 mm. longis 2–2.5 mm. crassis costatis inter costas pallide scariosis, costis herbaceis brunneis vel purpurascentibus supra in dentes prolongatis, dentibus triangularibus vel lanceolatis supremo recto 2–3 mm. longo ceteris 1–2 mm. longis; corolla alba 14–18 mm. longa; tubo 10–14 mm. longo recto parte inferiori 3 mm. longo gracillimo ca. 0.7 mm. crasso per calycem occulto, parte superiori et media tubulato 1–1.5 mm. crasso, extus glabro vel sparsissime inconspicueque villosulo, intus basem versus rariter retrorso-villoso; faucibus paullo inflatis et obliquis brevibus flavis; limba obliqua, lobis ascendentibus semiorbicularibus vel late ovatis 2–3 mm. latis apice rotundis reticulato-nervosis; staminibus 4 didymis (vel rariter 2?), duobus inferioribus sterilibus supra medium corollae affixis linearibus; duobus superioribus perfectis cum filamentis linearibus glabris infra medium corollae affixis, antheris orbicularibus bilocularibus 1 mm. diametro; stigmate bilobato lobis latissimis margine superiori incrassatis et viscoso-glandulosis inferne auriculatis et scariosis antheras amplectentibus; capsulis ovoideis calyce inclusis; seminibus parvulis brunneis obscure alveolatis.—PERU. Lima: San Bartolomé, ca. 1550 m. alt., April 4, 1910, *Weberbauer 5297;* hills near Chosica, ca. 1650 m. alt., April 1910, *Weberbauer 5325;* grassy slope, Matucana, ca. 2400 m. alt., April–May, 1922,

Macbride & Featherstone 375. Moquegua: Mt. Estuquiña northwest of Moquegua, ca. 1650 m. alt., March 22, 1925, *Weberbauer 7424a* (TYPE, Field Mus.); between Moquegua and Torata, ca. 1950 m. alt., March 21, 1925, *Weberbauer 7424.*

This species, one of the Loma-plants, is obviously most closely related to the other annual Peruvian species, **Salpiglossis acutiloba** nom. nov. [=*S. linearis* Johnston, Contr. Gray Herb. lxxxi. 96 (1928); not Hook. (1831)], but differs conspicuously in the form of the corolla-lobes, in the form of the stigma and in the ribbed somewhat curved calyx. The corolla is less pubescent inside and the lower pair of stamens bear rudimentary anthers. When I described *S. acutiloba* I emphasized the occurrence of the fifth stamen. I am now inclined, however, to agree with Miers, Illust. So. Am. Pl. ii. 58 (1857), and believe that the fifth stamen may be present or absent in most species of the genus. In form the emarginate and lobed stigma of *S. albiflora* is very similar to that of *S. schwenkioides* (Benth.) Wetts. and consequently quite different from the rhomboidal non-emarginate stigma of *S. acutiloba.*

Polyachyrus mollendoensis, sp. nov., scandens; ramis elongatis scandentibus fistulosis minute abundanter glandulosis glabris; foliis grandis 1–1.8 dm. longis 4–8 cm. latis irregulariter pinnato-lobatis herbaceis supra glaberrimis minute glandulosis subtus dense incano-arachnoideis margine paullulo revolutis, basi in auriculas conspicuosissimas 2.5 cm. latas amplexicaules productis vix decurrentibus, lobulis grossis 3–4-jugatis integris vel sinuato-marginatis apice obtusis vel rotundis, longitudine lobi latitudini subaequilonga; glomerulis capitulorum 1.8–2 cm. diametro subglobosis 1–5 cm. longe pedunculatis 2–4 in cymam laxissimam dispositis; pedunculis bracteis lanceolato-cordatis 1–2 cm. longis ornatis; receptaculo glomeruli subgloboso tomentoso, bracteis 5–6 mm. longis lanceolato-subulatis sparse glanduliferis; involucris flosculorum 1–2-floris 5.5 mm. longis glaberrimis non rariter sparse glanduliferis; tegulo exteriori paullo supra basem callo prominenti saepe notato; flosculis rosaceis 8–9 mm. longis, tubo (faucibus vix differentiatis) 4.5 mm. longo extus glanduloso, labia interiori in lobos 2 acutos 4 mm. longos ligulatos divisa, labia exteriori 2.1 mm. lata 4–4.5 mm. longa apice truncata tridentata; antheris (partibus polliniferis) linearibus 1.5 mm. longis apice appendicula 1.8 mm. longa hyalina coronatis basi caudis 1.5 mm. longis ornatis; setis pappi 5 mm. longis.—PERU: about rocks on side of gulch at lower edge of fertile belt in hills directly back of Mollendo, Dept. Arequipa, Oct. 16, 1925, *Johnston 3538* (TYPE, Gray Herb.).

This species is obviously most closely related to *P. glandulosus* Nutt (*P. villosus* Wedd.) but is a coarse scandent, rather than an erect slender plant, and has very large leaves with 3–4-jugate very broad rounded lobes, rather than much smaller ones with 5–6-jugate elongate angularly toothed or lobulate lobes. The florets are pinkish with stamens of a similar although somewhat darker shade.

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LXXXVI.

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS

By H. K. SVENSON

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXVI

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS[1]

H. K. Svenson

(Plates 188 to 191)

INTRODUCTION

It is twenty years since the publication of fragments of C. B. Clarke's monographic work on the *Cyperaceae*. Since that time extensive explorations have been made in the New World where *Eleocharis* has its greatest concentration and where the concept of species within this genus has greatly changed in the last two decades. The nomenclature which Clarke employed is in great need of revision, and, moreover, there has been a lack of critical comparison between Old World and New World forms. Of Clarke's manuscript, nothing has been published except an abstract of species arranged in systematic order and a series of illustrations of selected species from the various genera.

The present work deals with the taxonomy and geographic distribution of *Eleocharis*, a genus of the *Cyperaceae*, consisting of more than a hundred species of aquatic and semi-aquatic plants, inhabiting salt marshes, bogs, and shallow waters of ponds from the tropics to the polar regions of both hemispheres. A genus characteristically without leaves and therefore without the complex foliar variations of leafy plants, it has the photosynthetic activities transferred to the culm. The chief differentiation of species lies in the character of the

[1] A Thesis submitted in partial fulfillment of the Requirements for the degree of Doctor of Philosophy in the Division of Biology, Harvard University, 1928.

achene, and in the study of this the author has constantly employed a binocular dissecting microscope.

For assistance the author is especially indebted to Professor M. L. Fernald, under whose supervision the work was carried out, and to Dr. R. L. Robinson for his kindly advice in many matters, and to the other members of the staff of the Gray Herbarium; to Dr. F. W. Pennell for valuable assistance in the examination of the Muhlenberg, Short and Porter herbaria at the Philadelphia Academy of Sciences and for the loan of material; to Dr. P. A. Munz of Pomona College for the loan of a large collection of *Eleocharis* from the western United States, including the collection of M. E. Jones; to Dr. Gunnar Samuelsson of the Botanical Museum of Stockholm for the loan of South American and West Indian material; to the staff of the New York Botanic Garden, and especially to Dr. J. K. Small; to Dr. M. O. Malte for the loan of material from the Canadian National Museum; and to the National Herbarium at Washington for the loan of South American and Mexican specimens; and to all others who have helped in the loan of specimens and otherwise. The writer has been very fortunate in having at the Gray Herbarium authentic material of most of the species of the Old World, represented by specimens from the collections of Thwaites, Wallich, Hooker, Schweinfurth, Seemann, Mueller, Zollinger, and others, without which a treatment of *Eleocharis* would have been impossible.

From a purely nomenclatorial point of view the genus is of great interest. The name *Eleocharis* given by Robert Brown (1810), is derived from ἕλος (a marsh) and χάρις (grace) and refers to the aquatic habitat. In forming the name Brown did not include the letter "h," represented in Greek only by the rough-breathing mark. Whether *Eleocharis* or *Heleocharis* is the correct spelling has consequently been a source of contention, with continental botanists for the greater part insisting on the "h".[1] C. B. Clarke solved the problem in a very simple manner, by rejecting all combinations under *Heleocharis*, which is not, however, a method that appeals to common sense; and it has been the custom of practically all workers

[1] According to Ascherson & Graebner, Syn, i. 400, footnote 1 (1897), in discussing the similar names *Elodea* and *Helodea*, it arises from "der französischen Unsitte, den griechischen Spiritus asper unbeachtet zu lassen." Yet, withal, Ascherson & Graebner, in citing the derivation of *Eleocharis* (l c. ii. 289, footnote 1) omit the initial aspirate. Sprague, Kew Bull. Misc. Inf. 1928: 352 (1928) upholds the spelling *Eleocharis* as required by the International Rules of Nomenclature, and his remarks under *Rynchospora* (l. c. 360) are apropos.

to follow the *Index Kewensis* in treating the matter as merely a trivial variation in orthography. In the present paper the variation in the initial letter has not been considered as worthy of differentiation in citing synonymy. However, *Heleocharis* as a name is unjustifiable for several reasons. First, we have no right under the rules to change the original spelling; second, in combining two Greek words into so-called Latin nomenclature, a new language is formed which is not rigorously subject to previous usage; and finally, the name *Heleocharis* tends to be confused with names compounded from "helios" the sun. Into this error Lindley[1] drifted in an unfortunate attempt to correct the name, and others following him have, likewise, erroneously written "*Heliocharis.*"

But little is to be gained by an extended review of the classification of *Eleocharis.* Practically all classifications have been based upon arbitrary characters, and are purely artificial. The author has divided the genus into eleven series which he believes to represent natural groups. Under each series are cited the commoner species belonging to it, so that, provided the specimen in hand has mature fruit, there should be little difficulty in determining the affinities of the plant. Robert Brown, Prod. 224 (1810), set apart *Eleocharis* from *Scirpus* and characterized it as follows:

> *Squamae* undique imbricatae, conformis: vix ullae steriles. *Setae* hypogynae (4–12) denticulatae, rarò nullae. *Stylus* 2–3-fidus, basi dilatatâ cum ovario articulatâ. *Nux* saepiùs lenticularis, basi dilatatâ induratâ styli coronata.

It is, accordingly, to be separated from *Scirpus* on the basis of monocephalic inflorescence without bracts, i. e., "nuda," and an "indurated" style-base which is "dilated" and "articulated" with the ovary. This description applies very well to *E. palustris,* which has generally been taken as typifying the genus, but as in other genera of the *Cyperaceae,* difficulty has arisen in limitation of the description to a natural group. Especially has this been true of the series *Pauciflorae* represented by *E. pauciflora, E. parvula,* and *E. rostellata,* the members still being treated by European and some American botanists as either *Scirpus* or *Eleocharis* (*Heleocharis*).

[1] Lindl. Syn. Brit. Fl. 280 (1829) and in succeeding editions. The name is still further complicated by the spelling *Elaeocharis* employed by Ledebour and Schur, arising perhaps from a misconception of the derivation. Also Schultes, Mant. ii. 2 (1824) apparently misread *Heleophila* for *Heleophylax* Lestib. Essai Cyp. 41 (1819) (which seems to refer to *Scirpus validus,* etc.) and substituted the name *Heleogiton* ("character ut in *Heleochari.* Semen nudum") because of the pre-existing *Heliophila.*

However, it seems clear, as it did to Palla[1] on the basis of anatomical investigation, that we are dealing with true *Eleocharis*, for the style-base, though small, is clearly and sharply different in texture from the remainder of the achene (although under insufficient magnification they may appear homogeneous) and is invariably thicker at its junction with the body of the achene than with the base of the style; therefore, it may be interpreted as both "dilated" and "articulated." It is otherwise in the monocephalic *Scirpus Clintonii* and *S. planifolius* of eastern North America, which are related to *Scirpus hudsonianus* (Michx.) Fernald[2] (*Eriophorum alpinum* L.). These have the lowest scale extended as a bract and the soft granular texture of the achene associated with *Scirpus* and *Eriophorum*. Palla's anatomical work undoubtedly paves the way for an understanding of the natural genera under the *Cyperaceae*. However, his separation of *Scirpus* into eight genera:—*Dichostylis* (various species of *Cyperus* and *Fimbristylis*), *Trichophorum*[3] (*S. hudsonianus* Fernald, and allied species), *Scirpus* (*S. cyperinus* and allies), *Holoschoenus* (*S. Holoschoenus*), *Blysmus* (*S. rufus* and *S. Caricis*), *Schoenoplectus* (*S. americanus* and allies), *Heleocharis* and *Isolepis* (*S. carinatus* A. Gray and allies)—increases the already unwieldy number in the *Cyperaceae;* and most of them will probably continue to be treated as sections of *Scirpus*. Palla's treatment has, however, been followed by Schinz & Keller. A great contribution to the knowledge of the *Cyperaceae* has been made by Nees ab Esenbeck,[4] although he split the family into innumerable genera too finely drawn to be accepted at the present time. Several of these genera, i. e., *Chaetocyperus, Limnochloa, Scirpidium, Eleogenus* and *Eleocharis* are now generally included under *Eleocharis*.

In his classic observations on the homology of floral parts in the

[1] Palla, Zur Kenntnis der Gattung "Scirpus," Engler, Bot. Jahrb. x. 299 (1889).

[2] Fernald, Rhodora, viii. 161 (1906); for detailed discussion see Fernald Rhodora, vii. 131, 132 (1905).

[3] *Trichophorum*, as interpreted by Palla, l. c. (1889) and Bot. Zeit. liv. Ab. 1: 146 (1896), consisted of *Eriophorum alpinum* L. (*Scirpus hudsonianus* Fernald), *S. caespitosus* L. and *S. alpinus* Schleich., but did not include *S.* (*Eleocharis*) *pauciflorus* Lightf. as Richter erroneously intimated when he listed *Trichophorum pauciflorum* Palla as a synonym in Plantae Europaeae, 139 (1890). Palla, l. c. states that such a combination had never been made. *Trichophorum* was first separated as a genus by Persoon, Syn. i. 69 (1805), a "genus intermedium inter S c i r p i u m et E r i o p h o r u m," on the basis of the elongated bristles, and comprised *S. alpinus* and *S. cyperinus*.

[4] Especially Nees, Cyperaceae in Wight, Contrib. Bot. Ind. (1834); Linnaea, ix. 273-306 (1834); and in Martius, Fl. Bras. ii. (1842).

Cyperaceae, Nees, Linnaea, ix. 281 (1834) wrote: "the pistil consists normally of three carpels, keeled, valvately united, and grown together inwardly, the angles alternating with the inner stamens. From the ovules of these carpels only one develops. Not rarely a carpel is lacking, most generally the one turned toward the axis. The fruit then becomes lenticular or plano-convex with a more convex outer face. The style is more or less 2–3 parted, and the number of these partitions denotes the form of the fruit, whether triangular or lenticular" [translation mine].

Recent subdivisions of *Eleocharis*[1] have been largely based on the number of style-parts (2 or 3) and on the concomitant flattened or triangular achene. However, series of forms can be demonstrated in wholly different groups showing a transition from triangular to lenticular achenes.[2] This criterion, therefore, cannot in itself be maintained as a basis for the separation of sections or subgenera within *Eleocharis*. However, where such a transitional series exists, it may be inferred that species with triangular achenes are, other things being equal, phylogenetically older than those with plano-convex or lenticular achenes. *E. elongata* (confined to Florida) is the only member of the series *Mutatae* having triangular achenes, and it is also the most distinctly aquatic. Its close relatives, *E. Robbinsii* and *E. plicarhachis*, in their occasionally triangular achenes and the persistently triangular base of the style, show clearly the transition. A similar series may be found in the *Pauciflorae*. Plowman, Ann. Bot. xx. 25 (1906), on the basis of anatomical studies came to the conclusion that "*Eleocharis* is apparently a long-established and much reduced limicolous genus from near the common origin of the order." By him the *Monocotyledon* prototype is hypothetically considered as a large-leaved aquatic which was driven by drouth or flooding "to the dry banks, or carried into humus bogs and salt marshes," thus deriving on the one hand the rhizomatous genus *Carex* and on the other hand the tuberous genus *Cyperus*. At the same time came a reduction of fundamental tissue and changes in the stelar structure, notably the formation of amphivasal bundles.

Bristles and stamens are likewise exceedingly variable throughout the genus. The normal perianth of six bristles—of extreme import-

[1] Cf. C. B. Clarke, Kew Bull. Add. Ser. viii. 105 (1908).

[2] Such a characteristic is not confined to *Eleocharis* but occurs also in *Scirpus* and in the *Polygonaceae* (*Polygonum*).

ance in classification under the artificial Linnean system, even as to the delineation of genera (cf. *Isolepis* R. Br.)—is often reduced, or may be entirely absent.

The number of bristles may be exceedingly constant in some species, and their lack a situation of great rarity, as in *E. capitata* (*E. tenuis*); or the bristles may be commonly either present or absent, as in *E. Engelmanni* and *E. caribaea;* or they may be of a constant reduced size. In all cases the degree of variation is a character confined to the individual species. The bristles are very constant in their texture within a species, and this texture may prove to be one of the most valuable means of identification. In the case of the lenticular achene five bristles are normally found on the outer or abaxial face of the achene—the face which is enveloped by the subtending scale—and the sixth bristle, which belongs to the inner series, is found at the middle of the inner or axial face. The three stamens also occur on the outer face, one of them median, one at each margin of the achene. Where more than six bristles are present, the supernumerary bristles will be found to result from a branching of the bristle on the inner face. This is commonly bifid, resulting in a total of seven bristles, or as in *E. sphacelata*, may be divided into as many as four branches, giving a total of nine bristles. Due to the pressure of time the writer has not had opportunity to study in a detailed way the anatomy of the achene, especially with reference to variation of carpels in the lenticular achene as compared with the triangular achene. Is the lenticular achene induced by crowding in the spikelet, or by the more advantageous position taken up by the stamens toward the periphery of the spikelet?

Two monographs dealing with the North American species of *Eleocharis* have appeared; the first of these by Torrey[1] and the more recent by Britton.[2] The volumes by Roemer & Schultes (1817), Kunth (1837) and Steudel (1855) are mainly compilations, and the work of Boeckeler is to a large extent merely a description of plants without critical comparison between the species. C. B. Clarke's monograph of the *Cyperaceae* has never been published but his classification of species[3] and illustrations[4] were issued after his death. The bibliography has been assembled (at the end of this paper)

[1] Torr. Ann. Lyc. Nat. Hist. N. Y. iii. 296–316 (1836).
[2] Britt. Journ. N. Y. Micr. Soc. v. no. 4: 95–111 (1889).
[3] Clarke, Kew Bull. Add. Ser. viii. (1908).
[4] Clarke, Illustr. Cyperac. London. (1909).

from three points of view: (1) a citation of recent literature dealing with *Eleocharis;* (2) a citation of a few fundamental systematic treatments; (3) the assembling of scattered publications of C. B. Clarke dealing with *Eleocharis.*

In the problem of dealing with entities below the specific rank it is the policy to treat as *varieties* those which show a definite geographic segregation; and as *forms* those without geographical segregation.

The following abbreviations for herbaria are used:

Canadian National Museum—(C.)
United States National Museum—(U.S.)
New England Botanical Club—(N.E.B.C.)
New York Botanic Garden—(N.Y.)
Pomona College—(P.)
Philadelphia Academy of Sciences—(Ph.)
Botanical Museum, Stockholm—(S.)
Gray Herbarium—(G.)

Unless otherwise noted, specimens are in the Gray Herbarium.[1]

ELEOCHARIS

Preliminary Conspectus of the Genus

Series 1. Mutatae *Limnochloa* Nees in Wight, Contr. Bot. Ind. 71 (1834) and Linnaea, ix. 294 (1834), not Lestib. Essai Cyp. 41 (1819) nor Reichb. Fl. Germ. Excurs. i. 78 (1830). *Eleocharis* § *Limnochloa* Torr. Ann. Lyc. Nat. Hist. N. Y. iii. 296 (1836). *Eleocharis* Subgen. *Limnochloa* C. B. Clarke, Kew Bull. Add. Ser. viii. 105 (1908). Mostly coarse plants with swollen culms which are often as thick as the spikelets. Scales not keeled or only obscurely so, usually indurated, yellow, sometimes with a purple margin. Achenes lenticular (triangular only in some slender New World species), the bristles usually coarse. Style elongated, flat, 2-fid or 3-fid. *E. interstincta, E. dulcis* (*plantaginea*), *E. mutata, E. fistulosa, E. Robbinsii, E. cellulosa,* etc.

Series 2. Pauciflorae. *Scirpus* C. B. Clarke, Kew Bull. Add. Ser. viii. 111 (1908) in part. Style-base confluent with the apex of the achene (in some Andean species forming a ridge at the

[1] This paper on *Eleocharis* follows directly upon the work by Professor M. L. Fernald and Miss A. E. Brackett, The Representatives of Eleocharis palustris in North America, Rhodora xxxi. 57–77 (1929) and Contributions from the Gray Herbarium, no. lxxxiii. It has, therefore, seemed unnecessary to repeat the treatment of the North American species considered by them.

I have just received, from Professor Chermezon, too late to be incorporated in the present paper, a number of specimens of *Eleocharis* from Madagascar. These I hope to include in a succeeding paper. There has also just come to me the excellent and well-illustrated paper on *Eleocharis* by Barros, dealing in great detail with the genus in Argentina. This I must also leave for future consideration.

junction of the style-base and the body of the achene). Achenes greenish or tawny, trigonous, usually reticulate under high magnification. Style 3-fid. *E. pauciflora, E. parvula* (*Scirpus nanus*), *E. rostellata, E. albibracteata, E. Brehmeriana*, etc.

Series 3. Aciculares. *Eleocharis* Subgen. *Eu-eleocharis* Sec. *Aciculares* C. B. Clarke, l. c. 105. Achenes obscurely trigonous or terete, elongated, with longitudinal ridges separated by numerous trabeculae. Lowest scale fertile. Style 3-fid. *E. acicularis, E. cancellata, E. Wolfii, E. bonariensis*, etc.

Series 4. Ovatae. *Eleocharis* Subgen. *Eleogenus* b. *Capitatae* C. B. Clarke l. c. 105, in part. Style-base compressed, lamelliform; achenes biconvex, glistening-brown when mature, under magnification smooth. Style 2-fid. Cespitose annuals. *E. ovata, E. obtusa, E. Engelmanni, E. diandra, E. lanceolata.*

Series 5. Maculosae. *Eleocharis* Subgen. *Eleogenus* C. B. Clarke l. c. 105, in part. Style-base conical or depressed, not lamelliform. Achenes biconvex, black to reddish-brown or olive, the surface smooth or minutely wrinkled under magnification. Style 2-fid.

Sub-series: Ocreatae. Perennial; stoloniferous. Sheaths scarious at the apex. Achenes black to reddish-brown or olivaceous; pericarp marcescent, often slightly wrinkled under magnification. *E. flaccida, E. olivacea, E. maculosa, E. Sellowiana, E. debilis*, etc.

Sub-series: Rigidae. Annual; without stolons. Sheaths firm at apex. Achenes black or purplish; pericarp not marcescent. *E. atropurpurea, E. caribaea, E. praticola*, etc.

Series 6. Palustriformes. Style-base spongy, beak-like, rarely depressed. Achenes bright-yellow to tawny or olivaceous, biconvex or trigonous, smooth to alveolate. Plants usually stoloniferous, with strict, elongated, sometimes spongy culms.

Sub-series: Palustres. *Eleocharis* Subgen. *Eleogenus* c. *Palustres* C. B. Clarke, l. c. 105. Style 2-fid. Upper sheaths oblique at the summit. Achenes lenticular (biconvex), yellow or brown, smooth under magnification. *E. palustris, E. uniglumis, E. mamillata*, etc.

Sub-series: Truncatae. *Eleocharis* Subgen. *Eu-eleocharis* Sect. *Leiocarpeae* c. *Montanae* C. B. Clarke l. c. 106, in part. Styles 3-fid. Upper sheaths truncate, indurated, with a small apiculate projection. Achenes trigonous (in *E. nodulosa* and *E. geniculata* almost or quite lenticular); the surface under magnification alveolate, reticulate or smooth. (In *E. nodulosa* the style is frequently 2-fid.)

Culms not septate, *E. montana, E. capitata* (*E. tenuis*), *E. compressa, E. nitida, E. arenicola, E. tricostata, E. densa, E. Bolanderi*, etc.

Culms septate: *E. nodulosa, E. geniculata.*

Note: To this series also belongs *E. fallax* Weatherby.

Series 7. INTERMEDIAE. Style-base elongated, beak-like; style 2-fid or 3-fid. Achenes elongated, olivaceous, lenticular or obscurely 3-angled; under magnification striate or minutely reticulate. Cespitose plants with weak culms and acuminate spikelets. *E. intermedia, E. Macounii, E. carniolica, E. afflata, E. Widgrenii,* etc.

Series 8. TENUISSIMAE. Plants for the most part dwarf, tufted, and with capillary culms. Achenes small (0.4–1 mm. long), sharply or obscurely trigonous (in *E. savannarum* almost lenticular). Spikelets often distichous. Achenes present at the culm-bases in many species. Style 3-fid.

Sub-series: CHAETARIAE. *Eleocharis* Subgen. *Eu-eleocharis* Sect. *Chaetarieae* C. B. Clarke, l. c. 106, in part. Achenes coarsely reticulate, *i. e.* cancellate. *E. retroflexa, E. arenaria, E. savannarum,* etc.

Sub-series: LEIOCARPEAE. *Eleocharis* Subgen. *Eu-eleocharis* Sect. *Leiocarpeae* C. B. Clarke, l. c. 106, in part. Achenes smooth or very finely reticulate under magnification.

Spikelets not distichous or only obscurely so. *E. microcarpa, E. nana, E. Torreyana, E. nigrescens,* etc.

Spikelets clearly distichous: *E. Baldwinii, E. oligantha, E. minima, E. urceolata.*

Series 9. SULCATAE. *Eleocharis* Subgen. *Eu-eleocharis* Sect. *Leiocarpeae* b. *Sulcatae* C. B. Clarke, l. c. 106, in part. Achenes white, sharply or obscurely trigonous, usually exceeding 1 mm. in length. Culms usually strict and coarser than in the preceding section. Style 3-fid. *E. sulcata, E. pachystyla, E. pachycarpa, E. albida, E. bermudiana,* etc.

Series 10. MELANOCARPEAE. Achenes black, smooth, sharply trigonous. *E. melanocarpa.*

Series 11. TUBERCULOSAE. *Eleocharis* Subgen. *Eu-eleocharis* Sect. *Chaetarieae* C. B. Clarke, l. c. 106, in part. Achenes obscurely trigonous; style-base enlarged and mitriform, sometimes equalling the body of the achene in size. The American species with achenes deeply cancellate. *E. tuberculosa, E. simplex, E. tetraquetra, E. Wichurai.*

Series MUTATAE

(Plate 188)

a. Culms septate....*b.*

b. Surface of achene reticulate, often with conspicuous longitidinal ridges....*c.*

c. Surface of the orbicular achene with inconspicuous hexagonal or square cells....*d.*

d. Spikelets 4–5 mm. in diameter; scales gray; bristles 6–7 ..... 13. *E. dulcis.*

d. Spikelets 5–8 mm. in diameter; scales light-brown; bristles 7–9..... 14. *E. sphacelata.*

c. Surface of achene with transverse linear cells....*e.*
e. Septa approximate below the spikelet; bristles coarse, exceeding the achene.....1. *E. interstincta.*
e. Septa not approximate; bristles poorly developed; achene nearly smooth.....2. *E. equisetoides.*
b. Surface of the elliptic achene merely punctulate; culms slender 15. *E. equisetina.*

a. Culms not septate....*f.*
f. Culms angled; bristles toothed....*g.*
g. Culms coarse (2–5 mm. in diameter)....*h.*
h. Culms 4-angled; achene constricted below the summit into a neck about ¼ the width of the achene.....3. *E. quadrangulata.*
h. Culms 3-angled....*i.*
i. Achene constricted below the summit into a neck about ½ the width of the achene.....7. *E. fistulosa.*
i. Achene not constricted, but gradually prolonged into a cellular beak....*j.*
j. Achene dark-brown, with obscure narrowly linear cells 5. *E. spiralis.*
j. Achene yellowish, with conspicuous quadrangular cells 4. *E. mutata.*
g. Culms slender (1–2 mm. in diameter)....*k.*
k. Achene 1 mm. long, trigonous; culms often floating...9. *E. elongata.*
k. Achene exceeding 1.5 mm. in length, lenticular (rarely trigonous in *E. Robbinsii* and *E. plicarhachis*)....*l.*
l. Surfaces of achene with deep-pitted hexagonal cells; spikelets elongate, with spreading scales..10. *E. philippinensis.*
l. Surfaces of achene with transverse quadrangular cells...*m.*
m. Achene elongate (about 4 mm. in length); spikelet appearing like a continuation of the sharply triangular culm.....8. *E. Robbinsii.*
m. Achene orbicular, 2–3 mm. long; spikelet contrasting with the obscurely triangular or terete culm....*n.*
n. Culms dull, rigid; faces of achene with 20–25 rows of linear-quadrangular cells; base of style ½–¾ the width of the achene..11. *E. variegata* var. *laxiflora.*
n. Culms shiny, soft; faces of achene with 12–15 rows of quadrangular cells; base of style ⅓ the width of the achene.....12. *E. plicarhachis.*
f. Culms terete; achene prolonged into a cellular beak; bristles without teeth.....6. *E. cellulosa.*

1. E. INTERSTINCTA (Vahl) R. & S. FIG. 2. Culms terete, 4–10 dm. high, about 5 mm. thick, septate; the septations becoming approximate below the spikelet: caudex short; roots coarse, light-brown or reddish-brown: sheaths membranous, pointed at the summit; the basal sheaths sometimes free and elongated: style 2- or 3-fid: stamens 3: spikelets cylindric, 1.5–4 cm. long, many-flowered: scales in several ranks, oblong, often acute, striate, straw-colored or grayish, with a scarious margin: achenes rough, 2 mm. long (excluding the style-base), yellow or gray, with prominent transverse rectangular cells often forming longitudinal ribs, and a pronounced annular thickening at the summit: style-base dark-brown: bristles 6, exceeding the achene, stout, flattened, with coarse teeth.—Syst. ii. 149 (1817); Britton, Journ. N. Y. Micr. Soc. v. 97 (1889) excl. *E. equisetoides*

and syn. in part; C. B. Clarke in Urb. Symb. Ant. ii. 60 (1900) in part, Ill. Cyp. t. 33, figs. 6–9 (1909). *Scirpus plantagineus* Swartz, Fl. Ind. Occ. i. 123 (1797), excl. syn.; and of many later auth., not of Retz. *S. interstinctus* Vahl, Enum. ii. 251 (1805). *Limnochloa articulata* Lindl. & Nees in Mart. Fl. Bras. ii.[1] 100 (1842).[1] *E. articulata* Kunth, En. ii. 157 (1837). *E. septata* Miq. Linnaea, xvii. 58 (1843). *E. articulata* Steud. Cyp. 81 (1855). *E. plantaginea* Boeckl. Linnaea, xxxvi. 474 (1869–1870) and Cyp. Nov. ii. 14 (1890), as applied to the American plant. *S. polygamus* Wright mss. ex Boeckl. Flora, lxiv. 78 (1881).—In shallow water, Texas, Bermuda Islands, West Indies, and northern and central South America. TEXAS: (W. Tex. to El Paso) *C. Wright* 707; Del Rio, *Neally* 112 (N.Y.). BERMUDA: *Robinson* 102; *Moore* 3010; *Collins* 169; *Harshberger* in 1905. CUBA: *C. Wright* 710, 3768 (as *S. polygamus*); *Combs* 431; Prov. Santiago, *Pollard & Palmer* 305; Isle of Pines, *Curtiss* 498. GRENADA: *Broadway* in 1905. JAMAICA: *Alexander* in 1850 (in part). HAITI: *Leonard* 3538. COLOMBIA: Santa Marta, *H. H. Smith* 245; San Antonio, *Langlassé* 34. BRITISH GIUANA: Georgetown, *Hitchcock* 16652. DUTCH GUIANA: *Hostmann* 661; *Samuels* 508. BRAZIL: *Burchell* 4159, 2650; Para, *Goeldi* 1039. BOLIVIA: Lake Rogagua, *Rusby* 1422.

Vahl first described this plant (as *Scirpus*) from Martfeld's West Indian collection, and characterized it as similar to *Scirpus geniculatus* but with "*isthmi superne approximati, nec remotissimi,*" a character which also separates it from the more northern *Eleocharis equisetoides*. In addition, the achene of *E. interstincta* is coarser than in *E. equisetoides*, with deeper pittings and stronger bristles. The Wright plant labeled *S. polygamus* (3768) in the Gray Herbarium is rather immature, with thin culm and elongated spikelets, but is unquestionably *E. interstincta*.[2] The figure in Britton & Brown Ill. Fl. is of *E. equisetoides*.

2. E. EQUISETOIDES (Ell.) Torr. FIG. 1. Culms terete, 5–10 dm. high, about 5 mm. thick, prominently septate at intervals of 1–5 cm.; the surface roughened by numerous minute projections: caudex short; roots coarse, reddish brown: sheaths membranous, pointed at the summit; those at the base often free from the culm and greatly elongated: style 2- or 3-fid: stamens 3: spikelets cylindric, 2–4 cm. long, many-flowered: scales in several ranks, oblong, striate, straw-colored, with an obscure purplish border beneath the scarious margin:

[1] *Eleocharis articulata* Kunth, Enum. ii. 157 (1837) was wrongly ascribed to Nees by Kunth (Flora, ix. 294 (1835) where Nees used the name *Limnochloa articulata* as a *nomen nudum*. The first valid publication of this synonym is in Martius, Flora Brasiliensis, as quoted above.

[2] Boeckeler, Flora, lxiv. 78 (1881) says that this plant is *E. plantaginea* R. Br., forma americana.

achenes nearly smooth, 2–2.5 cm. long (including the style-base), golden-yellow or light-brown, broadly obovate, biconvex, with fine transverse linear-rectangular reticulations: style-base dark-brown: bristles narrow and weak, rarely equalling the achene.—Ann. Lyc. N. Y. iii. 296 (1836). *Scirpus geniculatus* Pursh, Fl. Am. Sept. i. 55 (1814), not L. *S. equisetoides* Ell. Sk. S. Car. i. 79 (1816). *S. obtusus* Willd. in Spreng. Syst. i. 204 (1825), in part. *E. Elliotti* A. Dietr. Sp. Pl. ii. 82 (1833). *E. interstincta* Britton, Journ. N. Y. Micr. Soc. v. 97 (1889), in part; Britton & Brown Ill. Fl. i. 248 (1896), as to fig. not (Vahl) R. & S.—Shallow water, Massachusetts to Florida and Texas, chiefly on the coastal plain, and locally inland to Michigan and Wisconsin. Massachusetts: Lake Waban, Wellesley, *Morong* in 1883; *Fernald & Wiegand*, Pl. Exs. Gray. 132. Rhode Island: Cumberland, *Olney;* Tippecan Pond, West Greenwich, *Graves & Woodward* in 1920. Connecticut: Long Pond, Thompson, *Weatherby* 4370. New York: Sag Harbor, L. I., *Cathan & Ferguson* 5829. New Jersey: pond south of Repaupo, *Van Pelt* in 1907. Maryland: Salisbury, *Canby* in 1865. South Carolina: Santee Canal, *Ravenel.* Georgia: Sumter Co., *Harper* in 1897; Lee Co., between Rift and Chokee, *Harper* 1071. Florida: Eustis, *Nash* 1322. Michigan: Jackson Co., *J. Wright* in 1838; Pleasant Lake, *Hicks* in 1893. Illinois: Chicago (Wolf Lake), *Hill* in 1890 (mixed with *E. quadrangulata*). Texas: *C. Wright.* Louisiana: *Buckley* in herb. Short (Ph.).

This species can be readily distinguished from *E. interstincta* by the remote articulations below the spikelet and by the roughened character of the culms. The smooth achene is decidedly different. Pursh described *Scirpus geniculatus* from "the sea-shore of Virginia and Carolina"; but, although the Pursh specimens have disappeared, there can be no question as to the identity, for *E. geniculata* is confined to the tropics. The species (*E. equisetoides*) was described by Elliott from specimens collected by Schweinitz near Fayetteville, North Carolina, but was merged with the tropical *E. interstincta* by Clarke.

3. E. quadrangulata (Michx.) R. & S. Fig. 4. Culms 4-sided, with sharp angles, coarse, 5–10 dm. high, from a short caudex: roots coarse, gray, often tuber-bearing: sheaths red or brown, membranous, with a loose brown tip, glistening, sometimes prolonged into leaf-like blades: spikelets 2–5 cm. long, cylindric, acute: scales 4-ranked, elliptic, 5 mm. long, 2 mm. wide, rounded or somewhat acute, straw-colored, striate, not keeled: style 2- or 3-fid: stamens 3: achene 2.7–4.2 mm. long including the beak (1 mm. long), narrowly obovate, deep shining-brown, almost smooth, with about 24 rows of transverse linear cells, narowed at the summit to a neck about one-fourth the width of the achene, broadening again to form the base of

the elongated triangular style: bristles light-brown, equalling the achene, slender and obscurely toothed.—Syst. ii. 155 (1817); Torr. Ann. Lyc. N. Y. iii. 297 (1836); Boeckl. Linnaea, xxxvi. 472 (1869–1870); Fernald, RHODORA, xxvii. 38, t. 149, figs. 1–4 (1905). *Scirpus quadrangulatus* Michx. Fl. Bor.-Am. i. 30 (1803); Elliott, Sk. S. Car. i. 78, t. 3, fig. 2 (1816). *S. marginatus* Muhl. Gram. 28 (1817). *S. albomarginatus* R. & S. Mant. ii. 74 (1824). *E. mutata* Britton & Brown, Ill. Fl. ed. 2, i. 311, fig. 759 (1913), not *S. mutatus* L.—In ponds, often on peaty shores, Massachusetts to southern Ontario, south to Georgia, Louisiana and Texas, chiefly on the coastal plain. MASSACHUSETTS: Lake Waban, Wellesley, *Fernald & Wiegand*, Pl. Exs. Gray. 133. CONNECTICUT: West Pond, North Guilford, *Bartlett* 782. NEW YORK: Duck Lake, Conquest, *Wiegand, Eames & Randolph* 11410; Oneida Lake, *Curtiss* in 1866; Oswego Co., Paddy Lake, South Scriba, *W. W. Rowlee* in 1906. NEW JERSEY: Cape May, *Van Pelt* in 1906; Johnson's Pond, Dennisville, *C. F. Parker* in 1866; Swartswood Pond, Sussex Co., *Porter* in 1878. PENNSYLVANIA: Presque Isle, *Porter* in 1868. DELAWARE: *Canby;* Townsend, *Commons* in 1868. DISTRICT OF COLUMBIA: near Washington, *L. F. Ward* in 1884. VIRGINIA: Princess Anne Co., Salt Pond, *Randolph* 470; Cape Henry, *Randolph* 334; Chickahominy River, Wilcox Neck, *Grimes* 4125; Franklin, Southampton Co., *Heller* 1149. SOUTH CAROLINA: Santee Canal, *Ravenel.* GEORGIA: Chatham Co., near Savannah, *Harper* 1835. ONTARIO: Lambton Co., Sarnia Bay, *C. K. Dodge* in 1894. MICHIGAN: Ingham Co., Pine Lake *Thurber* in 1860. OHIO: Portage Co., E. Twin Lake, *Webb* in 1915. ILLINOIS: Chicago (Wolf Lake), *E. J. Hill* 90 in 1890 (in part). MISSOURI: Newton Co., *Bush* 370; St. Louis, *Drummond.* OKLAHOMA: Mill Pond, Sapulpa, *Bush* 631. LOUISIANA: *Carpenter.* TEXAS: Hempstead, *E. Hall* 695; E. Texas, *C. Wright.*

Originally described by Michaux from Carolina; but Muhlenberg independently described it (1817) as *S. marginatus*, a name antedated by *S. marginatus* Thunberg, Prod. Fl. Cap. 17 (1794) and therefore changed by Roemer and Schultes (1824) to *S. albomarginatus.* Britton has considered *E. quadrangulata* as only a form of *E. mutata* (L.) R. & S., but Fernald[1] has shown that it is quite distinct from *E. mutata*, in the constricted base of the tubercle and the consistently 4-angled culm. Torrey (l. c.) observed also the strong resemblance to *Scirpus acutangulus* Roxb.

4. E. MUTATA (L.) R. & S. FIG. 8. Culms sharply triangular,

[1] Fernald, M. L. The Validity of Eleocharis quadrangulata, RHODORA xxvii. 37–40, t. 149 (1925). Three species of America have recently been passing under the name *E. mutata:* namely *E. quadrangulata*, *E. mutata*, and *E. fistulosa*. *E. fistulosa* differs from *E. quadrangulata* in the 3-angled culm and smaller achenes with characteristic markings.

coarse, 4–10 dm. high, from a short caudex; roots very numerous, fibrous gray or brown: sheaths straw-colored or light brown, membranous, pointed at the summit, often elongated: spikelets 1.5–5 cm. long, cylindric, usually obtuse: scales many-ranked, straw-colored, thin, orbicular to obovate, with broad membranous sides, and an erose upper margin, often slightly keeled: style 3-fid: stamens 3: achene 1.7–2.3 mm. long (including the style-base), elliptical or obovate, shining, rather smooth, yellow to brown, with about 24 rows of shallow, transversely linear cells with their margins often slightly raised, surmounted at the summit by an annular thickening which merges gradually into the short style-base: bristles 6, irregular, equalling the achene, lustrous-brown, with coarse but soft teeth.—Syst. ii. 155 (1817); Kunth, Enum. ii. 154 (1837); C. B. Clarke in Urb. Symb. Ant. ii. 61 (1900), excl. syn.; Britton & Brown, Ill. Fl. ed. 2, i. 311 (1913), in part; Fernald, Rhodora, xxvii. 39, t. 149, figs. 11–14 (1925). *Scirpus mutatus* L. Amoen. Acad. v. 391 (1759); Sp. Pl. ed. 2, i. 71 (1762); Vahl. Enum. ii. 252 (1805); Griseb. Fl. Brit. W. I. 571 (1864). *Limnochloa mutata* Nees, Linnaea, ix. 294 (1835). *E. scariosa* Steud. Cyp. 80 (1855). *E. spiralis* Boeckl. Linnaea, xxxvi. 473 (1869–1870), as to American plant.—West Indies, Central America, and northern South America. Jamaica: *Harris* 12310. Porto Rico: *Sintenis.* 4942 (*H. spiralis* det. Boeckl.). St. Croix: *Ricksecker* 210. St. Jan: *Eggers* in 1877. Virgin Islands: *Fishlock* 316. Grenada: *Broadway* 1794. Panama: Canal Zone, *Pittier* 6775. Venezuela: vic. Maracaibo, *Pittier* 10685; El Limon near Maracay, *Pittier* 10116; vic. Cristobal Colon, *Broadway* 580. Colombia: Dept. El Valle, Buenaventura, *Killip* 11744. Galapagos Islands: Albemarle Is., *Snodgrass & Heller* 261;[1] *Stewart* 1081. Guadeloupe: *Duss* 3441. British Guiana: Pomeroon District, *De La Cruz* 941. French Guiana: *Broadway* 203. Brazil: *Martius* 229.[2] Paraguay: Cerros de Tobaty, *Hassler* 6414. (Guatemala: *Tuerckheim* 1283. The specimen is very young. It may belong with this species.)

The plant was originally described from Jamaica by Elmgren, a student of Linnaeus. It differs from *E. quadrangulata* in characters previously mentioned under that species, and also in the orbicular scales. It seems most closely related to *E. spiralis* of the Old World, to which it was referred by Boeckeler. The scales of *E. spiralis* are firmer, more sharply truncate, and the spikelets shorter and thicker

[1] Fernald Rhodora, xxvii. 39, and t. 149, fig. 11 (1925) considers this specimen as not characteristic, since the apex of the achene is somewhat constricted, and that it might be worthy of separation when more collections were available. The material is rather fragmentary. The achenes are smaller than the average but have the cellular structure and the same type of bristle as in typical *E. mutata*. The other collection (*Stewart* 1081) from Albemarle Island is typical *E. mutata*.

[2] *E. scariosa* Steud. was based on Nees 229, deriving its name from the scarious development of the lowest sheaths, which, however, is a common occurrence in the group to which *E. mutata* belongs.

than in *E. mutata*. The shiny achenes resemble those of *E. mutata* but are smoother, with finer markings and a deep chocolate-brown color. The bristles of the Borneo plant[1] are more slender and have irregularly scattered teeth.

In the spongy texture of the achene and the character of the beak, *E. mutata*, *E. spiralis* and *E. cellulosa* seem to form a group of closely related species. C. B. Clarke (Urb. Symb. Ant. ii. 61 (1900)) considered *E. mutata* a species quite different from *E. spiralis* R. Br., which grows in southeastern Asia, and perhaps best joined specifically with *E. fistulosa* Schultes, a species growing in both the Old and the New Worlds.

5. E. SPIRALIS (Rottb.) R. & S. FIG. 12. Culms sharply triangular, 4–8 dm. high, 2–3 mm. wide: spikelets cylindric, 1.5–2.5 cm. long, 5–6 mm. wide, obtuse: scales cuneate, 3 mm. long, light-brown, striate, firm; the truncate upper edge with a hyaline margin: style 3-fid: stamens 3: achene elliptic, 2–2.4 mm. long (including the beak), shining, dark-brown, lenticular, with about 20 rows of transverse linear-quadrangular cells, with light-brown beak: bristles 6, brown, equalling the body of the achene, with both antrorse and retrorse teeth.—Syst. ii. 155 (1817); Boeckl. Linnaea, xxxvi. 473 (1869–1870), in part; Benth. & Muell. Fl. Austr. vii. 292 (1878), in part; C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 627 (1893), in Durand & Schinz, Consp. Fl. Afr. v. 601 (1895), and Ill. Cyp. t. xxxv. figs. 5–7 (1908). *Scirpus spiralis* Rottb. Desc. et Ic. 45, t. xv. fig. 1 (1773); Roxb. Fl. Ind. (ed. Wall.) 215 (1820). *Limnochloa spiralis* Nees in Wight, Contrib. Bot. Ind. 114 (1834).—According to C. B. Clarke, the species occurs in southern India, Ceylon and Mauritius. BRITISH NORTH BORNEO: Jesselton, *Clemens* 9716 (distributed as *E. variegata*), is the only specimen of the species in the Gray Herbarium.

Very closely related to *E. cellulosa* and *E. mutata*[2] of the New World, which it resembles in the peculiar glassy surface of the achene, stout beak and short scales; but *E. spiralis* differs from *E. cellulosa* in the elongated linear cells of the achene, the less spongy beak, toothed bristles and truncate scales, and in the thicker spikelet. The description is largely based upon *Clemens* 9716 which lacks rootstocks. First described by Rottböll from specimens sent to him by Koenig from Malabaria (India), the name being derived from the spiral arrangement of the scales.

[1] There is no authentic material of *E. spiralis* in the Gray Herbarium, but *Clemens* 9716, from Borneo (distributed as *E. variegata*), agrees with Clarke's illustration of *E. spiralis* (C. B. Clarke, Ill. Cyp. t. xxxv. figs. 5–7 (1909)) and with descriptions.

[2] See discussion under *E. mutata*.

(To be continued.)

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS

H. K. Svenson

(*Continued from page 136*)

6. E. cellulosa Torr. Fig. 11. Culms terete, rarely triangular, 3–7 dm. high, 1–2 mm. wide, straw-colored or greenish: roots coarse, pale to dark brown; stolons elongated: the upper sheaths rigid, oblique, with an elongated mucronate tip, often purplish; lowest sheaths membranous and inflated or leaf-like: spikelets cylindric, 1.5–4.5 cm. long, obtuse, thicker than the culm: scales orbicular or obovate, obtuse, 4 mm. long, rigid, striated, straw-colored, with a conspicuous brown border and white scarious margins, the brown coloration sometimes wanting: style 3-fid: stamens 3: mature achene shining, brown, elliptic to obovate, lenticular, with about 20 rows of quadrangular cells, overlaid by a glass-like surface, merging at the summit into a stout, spongy beak, tipped by the short dark style-base: bristles light-brown, equaling the achene, involute, without teeth.—Ann. Lyc. N. Y. iii. 298 (1836); Britton, Journ. N. Y. Micr. Soc. v. 99 (1899); C. B. Clarke in Urb. Symb. Ant. ii. 62 (1900). *Scirpus dictyospermus* C. Wright in Sauv. Fl. Cub. 175 (1873).—Florida to Texas, West Indies, and Central America. Florida: Santa Rosa Island, *Tracy* 8661; Appalachicola, Biltmore herb. (*Chapman*) 3870; Lee Co., Myers, *Hitchcock* 403; Dade Co., *A. A. Eaton* 105; S. Jacksonville, *Curtiss* 6540; Miami, *Garber* in 1877; Titusville, *Nash* 2302; W. Fla., Palm Creek, *Curtiss* 183; Key West, *Blodgett*. Mississippi: Biloxi, *Tracy* 6503; Horn Island, *Tracy* 7680; Bay of St. Louis (*Ingalls*) as *S. quadrangulatus* Michx. Louisiana: Lake Charles, *Cocks* 3126. Texas: Fredericksburg, *Engelmann* 494; *Lindheimer* 719; Rio Cabeza, *Thurber* 32 in 1850; *C. Wright* 708 (W. Tex. to El Paso), Rio Grande in 1848. Bahama Islands: Andros, *A. E. Wight* 264; New Providence, *Britton & Brace* 505; *Britton & Brown* 305. Cuba: *C. Wright* 3763. Yucatan: Progresso, *Gaumer* 2402.

Closely related to *E. spiralis*.[1] First described by Torrey from specimens sent from Bay of St. Louis, Mississippi, by Dr. Ingalls.

7. E. fistulosa (Poir.) Link. Fig. 3. Culms sharply triangular, coarse, 4–6 dm. high: roots coarse, reddish-brown: sheaths brown, membranous, rather loose, pointed at the summit: spikelets 1.5–3.5 cm. long, cylindric, acute: scales 4 mm. long, straw-colored or gray, broadly ovate, obtuse or somewhat acute, firm, striate; the margins erose but not conspicuously membranous: style 3-fid: stamens 3: achene 2–2.4 mm. long (including the style-base), obovate, turgid, green or light brown, rough, with about 20 rows of deeply pitted quadrangular cells, the apex narrowed to a neck about one-third the width of the achene, broadening again to form the base of the tri-

[1] See discussion under *E. spiralis*.

angular style: bristles coarse, usually exceeding the achene, firmly toothed.—Link in Spreng. Jahrb. iii. 78 (1820); Schultes, Mant. ii. 89 (1824); Boeckl. Linnaea, xxxvi. 472 (1869–1870); Benth. & Muell. Fl. Austr. vii. 293 (1878); C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 626 (1893), in Durand & Schinz, Consp. Fl. Afr. v. 598 (1895), in Thiselton-Dyer, Fl. Cap. vii. 198 (1898), in Thiselton-Dyer, Fl. Trop. Afr. viii. 406 (1902) and Ill. Cyp. t. xxxv. figs. 1–4 (1908); Fernald, Rhodora, xxvii. 39–40, t. 149, figs. 5–10 (1925). *Scirpus fistulosus* Poir. Encyc. vi. 749 (1804). *S. acutangulus* and *S. medius* Roxb. Fl. Ind. (ed. Wall.) i. 216 (1820). *Baeothryon fistulosum* A. Dietr. Sp. Pl. ii. 94 (1833). *Limnochloa acutangula* Nees and *L. media* Nees in Wight, Contrib. Bot. Ind. 114 (1834). *L. fistulosa* Nees, Linnaea, ix. 294 (1835). *E. planiculmis* Steud. Cyp. 80 (1855).—West Indies and tropical South America, Asia, Africa. Cuba: *C. Wright* 3375, 3376. Mexico: Orizaba, *Botteri* 756. Panama: Prov. Panama, Chepo, *Pittier* 4557. Colombia: Polonia, *Killip & Smith* 14914; Aguasucia, *Langlassé* 87; Dept. El Valle, Calima, *Killip* 11247. Galapagos Islands: Chatham Is., *Stewart* 1080. Bolivia: Dept. Santa Cruz, Prov. Sara, *Steinbach* 7444. Paraguay: Sierra de Maracayu, *Hassler* 5676; Cordillera de Villa-Rica, *Hassler* 8589; N. Paraguay, *Fiebrig* 5349. Ceylon: *Thwaites* 3162. India: Nepal, *Wallich;* mountains of Khasia, *Hooker & Thomson.* China: Hupeh, *Henry* 4102. Japan: Katsura, *Sakuraj* 51. Sierra Leone: *Elliot* 4453. Central Africa: Djur, *Schweinfurth* 2326.

Described by Poiret (1804) from specimens collected by Du Petit-Thouars in Madagascar, and by Roxburgh (1820) from India as *Scirpus acutangulus* (*S. medius* is only a smaller form, less sharply angled). Clarke included the American plant under *Eleocharis mutata*, but Boeckeler, as noted by Fernald (l. c.), recognized the American plant as *E. fistulosa*. *E. planiculmis* was based on *Zollinger* 284 from Java. In the turgid, almost globose achenes, with coarse reticulation, and stout bristles, it seems related to *E. variegata* var. *laxiflora* and *E. philippinensis*. The characteristics differentiating *E. fistulosa* from *E. quadrangulata* and *E. mutata* have been clearly discussed by Fernald (l. c.). According to Clarke (in Thiselton-Dyer, Fl. Trop. Afr. viii. 406), "the corresponding species in Tropical America, *E. mutata*, R. Br., is exceedingly near this, and is united with it, perhaps rightly, by Boeckeler." This statement is not wholly correct; Boeckeler considered *E. mutata* synonymous with *E. spiralis* (Boeckl. l. c. 473). *Schweinfurth* 2326 from Central Africa, has achenes 2.8 mm. long, with a short neck one-half as wide as the achene, and with linear transverse cells. The bristles are without teeth and do not exceed the achene. This was described by Boeckeler,

Flora, lxii. 563 (1876) as *E. fistulosa* var. (β) *robusta* "culmo validiore 2½–3 lin. diam. haud compresso, rhizomate elongato lignoso-duro perpendicul. descendente"; it may represent a distinct species.

8. E. Robbinsii Oakes. Fig. 5. Culms slender, 1–2 mm. wide, 2–7 dm. high, triangular, sometimes producing tufts of capillary stems which float in the water: roots either fibrous or spongy; stolons slender and elongate, the nodes inconspicuous: sheaths dull-brown; the summit oblique: spikelet 1–2.5 cm. long, acute, scarcely wider than the culm: scales few (4–9), lanceolate, 7 mm. long, greenish, striate, the margins and tip scarious, with a keel formed by 2 or 3 prominent longitudinal ridges: style 3-fid: stamens 3: achenes brown, 2–2.5 mm. long (not including the slender, elongate style-base), oblong-obovate, narrowed below the middle, lenticular, rarely triangular, turgid, with 15–18 rows of shallow, transversely linear-rectangular cells, narrowed at the apex to a neck one-half the width of the achene, broadening again to form the base of the flattened style: bristles 7, closely and firmly toothed, twice as long as the achene. —Hovey's Mag. Hort. vii. 178 (1841); Britton, Journ. N. Y. Micr. Soc. v. 99 (1889); Robinson & Fernald in Gray, Man. ed. 7, 181, fig. 240 (1908). *E. variegata* Boeckl. Linnaea, xxxvi. 471 (1869–1870) in part.—In shallow water at the borders of ponds, Nova Scotia and southern New Brunswick to Florida, chiefly on the coastal plain, and westward through central New York to Michigan, Indiana and Ontario. The following, from the numerous specimens examined, are typical. Nova Scotia: Belle Isle, *Fernald et al.* 23363; Five Island Lake, *Fernald et al.* 23364; Tiddville, *Fernald & Long*, 20126; Argyle, *Pease, Long & Linder* 20124; Windsor Junction, *Howe & Lang* 404. New Brunswick: Kendrick's Lake, St. Stephen, *Macoun* 32222 (C.). Maine: Wilton, *Fernald* in 1894. New Hampshire: Wentworth, *E. F. Williams* in 1908. Massachusetts: Spot Pond, *Oakes* in 1865; Newton, *Oakes* in 1864; Dedham, *Faxon* in 1878; Plymouth, *Boott* in 1864, *Oakes* in 1839; Brewster, *Fernald* 16296; Yarmouth, *Fernald & Long*, 8841; Springfield, *M. L. Owen* in 1880. Rhode Island: Cranston, *Olney*. Connecticut: North Guilford, *Bartlett* in 1906; Salisbury, *Bissell* in 1906; Monroe, *Eames* in 1895. New York: Wading River, *E. S. Miller* in 1871. New Jersey: Forked River, *Long* 5283; Quaker Bridge, *Parker* in 1867; Delanco, *Van Pelt* in 1907; Dennisville, *Parker* in 1866. Delaware: Felton, *Canby* in 1874. Georgia: Lee Co., near Rift, *Harper* 1068. Florida: *Chapman* (Quincy, according to Chapman, Fl. S. U. S. 515, 1860). Ontario: Temagami Forest Reserve, *W. R. Watson* 442 (C.). Michigan: Park Lake near Agricultural College, *Wheeler* in 1890; Pine Lake near Agricultural College, *Wheeler* in 1897. Indiana: Dune Park, *E. J. Hill* in 1897 and 1898, *Umbach* in Kneucker, Cyp. et Junc. Exsicc. 225.

Described by Oakes from ponds in northern New Hampshire and

southeastern Massachusetts. In outward appearance close to *E. variegata* var. *laxiflora*, from which it differs in its smaller stature, more slender stolons, longer scales, and in the elongate, shiny, less turgid achenes conspicuously narrowed at the apex. It also has a superficial resemblance to *E. philippinensis*. Specimens collected by Wheeler in Michigan in 1890 differ from the typical *E. Robbinsii* in having the tubercle not contracted at the base, and bristles not exceeding the achene. A few of the achenes which were examined were triangular.

9. E. ELONGATA Chapm. FIG. 6. Culms very slender, usually less than 1 mm. in width, elongated, 5–8 dm. long, often floating on the surface of the water, flattened or obscurely angled: roots fibrous; stolons abundant, brown or straw-colored, elongated, with culms rising from the nodes; spikelets 1–1.5 cm. long, 2 mm. wide, acute: style 3-fid: stamens 3: scales linear, obtuse, 3.5 mm. long, striate, greenish, conspicuously bordered with brown just within the hyaline margin: achenes 1.5 mm. long including the style-base, triangular, light green, obovate (the inner face broadest, with about 12 rows of coarse transversely linear cells), abruptly narrowed at the summit to a short neck one-fourth the width of the achene, from which rises the short acute deep-brown style-base: bristles 6 or 7, equalling the achene, greenish, prominently toothed.—Fl. S. U. S. 515 (1860); Small, Fl. Se. U. S. 182 (1903).—This species is confined to Florida. The following specimens are cited from the Gray Herbarium. FLORIDA: Eustis, Lake Co., *Nash* 944; Lake Como, Putnam Co., *Curtiss* 6674; Dade Co., *Garber* in 1877; *Chapman*.

This plant is closely allied to *E. Robbinsii*. The achenes are characteristically triangular, in this respect differing from any other members of the group, although occasionally triangular achenes occur in *E. Robbinsii*.

10. E. **philippinensis**, n. sp. (FIG. 9), culmi elongati 3–5 dm. alti, circa 2 mm. diametro; radicibus brunneis, stolonibus longis nodis manifestis; vaginis ad apicem laxis; spiculis cylindricis 2–5 cm. longis circa 3 mm. crassis; squamis fusco-viridescentibus quadrifariis subulatis vel lanceolatis circa 4 mm. longis striatis carinatisque, apice exsertis subsquarrosis; achaenio 2–2.3 mm. longo obovato infra medium angustato biconvexo turgido fusco latere utroque cum cellulis hexagonis 15–20-seriatis striato, ad apicem annulo toroso truncato instructo achenio quarto parte angustiore; stylobasi complanato; setis 7, serie interiori apicem stylobasis, serie exteriori apicem achenii aequante retrorsim cum dentibus firmis scabris—*E. variegata* var. *laxiflora* Merrill, Enum. Phil. Pl. 121 (1922), not Clarke.—PHILIPPINE ISLANDS: Luzon, Prov. Bulacan, *Ramos* in Merrill, Phil. Pl.

1461; Prov. Rizal, *Merrill* in Oct. 1909; Prov. Rizal, July, 1906, *Ramos* 1112 (TYPE in Gray Herb.).

This plant differs from *E. variegata* var. *laxiflora* in the soft culms and sheaths, in the slender, elongate spikelet with its spreading scales; in the smaller, more truncate achene, with hexagonal cells (in *E. variegata* var. *laxiflora* the cells are transversely linear); and in the shorter, unequal bristles. It is also related to *E. plicarhachis* of the New World.[1] The hexagonal markings of the achenes and the slender spikelets coincide with Clarke's illustration of the Australian *E. nuda*,[2] but the scale in the illustration is blunt and bristles are lacking. *E. philippinensis* may perhaps constitute a variety of *E. nuda*.

11. E. VARIEGATA (Poir.) Presl in Oken, Isis, xxi. 269 (1828); Kunth, Enum. ii. 153 (1837); Boeckl. Linnaea, xxxvi. 470 (1869–1870), in part. *Scirpus variegatus* Poir. Encyc. vi. 749 (1804). *E. Sieberi* Kunth, Enum. ii. 153 (1837). *Baeothryon variegatum* A. Dietr. Sp. Pl. ii. 92 (1833).

I have seen no authentic material. *Scirpus variegatus* was described by Poiret from specimens collected in Madagascar by Du Petit-Thouars, which, according to Presl and Kunth, are represented in the Willdenow herbarium. In Durand & Schinz,[3] Consp. Fl. Afr. v. 601 (1895), the Asiatic material is referred to var. *laxiflora* C. B. Clarke (*E. laxiflora* Thw.), and *E. Sieberi* (based on *Sieber* 19 from Mauritius, considered by Kunth as probably identical with *Scirpus variegatus*) is included as a synonym. Typical *E. variegata*, therefore, seems to be confined to Madagascar and Mauritius. The distribution is stated by Clarke as India, China, Malaysia, Polynesia and Cuba, but the Philippine plants are clearly distinct, and so is the Cuban material (*E. plicarhachis* = *E. elata*).[4] As treated by Boeckeler,[5] *E. Robbinsii* from North America is included under *E. variegata*, and *E. Sieberi* is maintained as a distinct species.

Var. LAXIFLORA (Thw.) C. B. Clarke. FIG. 10. Culms slender, terete or obscurely angled, striate, sulcate, 3.5–6 dm. high, rigid and flexuous, about 2 mm. wide: stolons thickened: sheaths firm, closely appressed at the summit, pointed, purplish at the base: spikelets 1–2 cm. long, cylindric or somewhat angled: scales rigid, lanceolate, 5 mm.

[1] See discussion under *E. plicarhachis*.

[2] Clarke, Ill. Cyp. t. xxxv, figs. 8–10 (1909).

[3] The text was contributed by C. B. Clarke.

[4] C. B. Clarke maintained *E. elata* as a distinct species. Kew Bull. Add. Ser. viii. 105 (1908).

[5] Linnaea, xxxvi. 471 (1869–1870).

long, often keeled, straw-colored or light brown: style 3-fid: stamens 3: achene rough, elliptic, 2.5–3 mm. long (including the style-base), biconvex, turgid, light-brown, with about 20 rows of transversely linear cells, the longitudinal ridges prominent, and an annular prominence at the somewhat narrowed apex, from which the flattened brown style-base rises: bristles 6 or 7, light-brown or yellow, coarse, strongly toothed, all exceeding the beak (style-base).—Clarke in Hook. f. Fl. Brit. Ind. vi. 626 (1893)[1] and in Durand & Schinz, Consp. Fl. Afr. v. 601 (1895), not C. B. Clarke, Cont. U. S. Nat. Herb., x. 455 (1908) nor Merrill, Enum. Phil. Pl. i. 121 (1922). *Scirpus laxiflorus* Thw. Pl. Zeyl. 435 (1864). *E. ochrostachys* Steud. Cyp. 80 (1855). *E. subulata* Boeckl. Flora, xli. 412 (1858); Koorders, Excursfl. Java, i. 197 (1911).—Southeastern Asia and Fiji Islands. CEYLON: *Thwaites* 3762 (TYPE COLL.). CHINA: Hong Kong, *Hance* 13333. FIJI ISLANDS: Sandalwood Bay, *U. S. Exploring Exped.* (Wilkes Exped.) 1838–1842.

The above description is based mainly upon *Thwaites* 3762. Thwaites raised the question whether *Scirpus laxiflorus* was to be considered as a form of *Eleocharis Sieberi*.[2] This, it seems to me, is the chief reason for uniting the Du Petit-Thouars Madagascar plants with the plants from India, *i. e.* the consideration of *S. laxiflorus* as a variety of *E. variegata*. No authentic specimens of *E. variegata* have been seen by me, but the descriptions seem not applicable to the Indian material.

C. B. Clarke in Hook. f. Fl. Br. Ind. vi. 626 (1893) cites *E. ochrostachys* from "MALACCA; *Griffith*. SINGAPORE; *Ridley*,—DISTRIB. Java, Borneo. . . *Spikelet* less than ½ in.—This does not differ much from very slender examples of *S. variegata* var. *laxiflora*, except by the numerous barren stems." *E. ochrostachys* was based upon *Zollinger* 291 from Java. The specimen under this number at the Gray Herbarium from "rice fields, Java" has only one fertile culm, and on that the spikelet is very small (5 mm.). Two of the remaining culms have rudimentary development of spikelets and the plant seems to have suffered adverse conditions, which may account for the reduction of fertile culms. Both the habit and achene are identical with those of *S. laxiflora*. Boeckeler described *E. subulata* from Griffith's collection from Malacca. This plant, which was without achenes, stood in Boeckeler's estimation closest to *E. ochrostachys* Steud. and *E. planiculmis* Steud. It was reduced

[1] Ridley's combination in Journ. Sing. Asiatic Soc. xxiii. 14 (1891) is without description or reference and a *nomen nudum*.

[2] Pl. Zeylan. 435 (1864).

to synonymy with *E. ochrostachys* by C. B. Clarke. The Wilkes Exped. specimen from Fiji is identical with a plant from the same expedition labeled "*E. obtusetrigona* Nees, Organ Mts. Brazil." There is evidently a confusion of labels.

12. E. **plicarhachis** (Griseb.), n. comb. Fig. 7. Erect from an ascending spongy rootstock, often with slender elongate rhizomes: culms wiry, flexuous, striate and sulcate, 2.5–6 dm. high: sheaths usually rigid, 4–8 cm. long, purplish or straw-colored, oblique at the summit: spikelets 1–2 cm. long, about 25-flowered, narrowly cylindric, acute: scales loose, 3.5 mm. long, linear, obtuse, striate, with an obvious midrib: style 2-fid: stamens 3: achene biconvex, 2 mm. long (including beak), light-brown, orbicular to obovate, with about 12 longitudinal rows of quadrate cells with upraised edges, narrowed at the summit and surmounted by a turgid annulus-elevation from which rises the deep-brown or black lanceolate style-base: bristles 6, exceeding the achene, coarse, flat, with strong scattered teeth.—*Scirpus plicarhachis* Griseb. Cat. Pl. Cub. 239 (1866). *E. elata* Boeckl. Vidensk. Medd. Kjöb. (1871) 151 (1871). *E. variegata* Boeckl. Flora, lxiv. 78 (1881), not Presl. *E. variegata* var. *laxiflora* Clarke in Urb. Symb. Ant. ii. 62 (1900) and Contr. U. S. Nat. Herb. x. 455 (1908), not *S. laxiflorus* Thw.—West Indies and South America. Cuba: *C. Wright* 3372 (type coll.). Paraguay: Lake Ipacaray, *Hassler* 12570 (as *E. elata*). Colombia: Dept. of Antioquia, Puerto Berrio, *F. W. Pennell* 3727.

Superficially resembling *E. philippinensis*, from which it differs in the shorter spikelet (in *E. philippinensis* the spikelet is 2.5–5 cm. long) and more appressed scales. In *E. philippinensis* the achenes are longer (2.2–3 mm.), more opaque, with hexagonal, more deeply-pitted cells and surmounted by a wider annulus and with a style-base similar in color to the achene; the bristles also are coarser and equipped with more numerous teeth. *E. plicarhachis* is also similar to *E. variegata* var. *laxiflora*, which has a much coarser culm and which differs in the opaque, turgid character of the achenes, in the more elevated annulus, in the dentition of the bristles and in the thick scaly stolons.

13. E. dulcis (Burm. f.) Trin. Fig. 16. Culms terete, 4–12 dm. high, 3–5 mm. thick, with conspicuous joints at intervals of 2 to 5 cm. and numerous regular but inconspicuous false septa between the joints, from a short vertical rootstock with coarse reddish-brown roots and prominent elongated stolons: sheaths membranous, pointed at the tip, quickly disintegrating: spikelets 1.5–6 cm. long, cylindric, acute, of the same diameter as the culm: scales light-gray or straw-colored, obovate, acute or blunt, chartaceous, 4–5 mm. long, striate,

with a midrib: style 2- or 3-fid; stamens 3: achene 1.8–2 mm. long (excluding the style-base), lenticular, elliptic, brown, the surface with numerous small hexagonal cells, rarely with no reticulations, narrowed at the summit to an inconspicuous annular thickening about half the width of the achene, from which rises the dark-brown flattened style-base: bristles 6–8, exceeding the achene, light-brown, usually irregularly toothed.—Trin. ex Henschel, Vita Rumph. 186 (1833); Merrill, Interpret. Herb. Amb. 104 (1917), Enum. Phil. Pl. i. 119 (1922). *Cyperus dulcis* Rumph. Herb. Amb. vi. 7, t. 3, fig. 1 (1750). *Andropogon dulce* Burm. f. Fl. Ind. 219 (1768). *Hippuris indica* Lour. Fl. Cochinch. 16 (1790). *E. plantaginea* R. & S. Syst. ii. 150 (1817); Thw. Pl. Zeylan. 352 (1864); Boeckl. Linnaea, xxxvi. 474 (1869–1870), excl. the American plant; Hook. f. in Trimen, Fl. Ceylon, v. 68 (1900); C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 625 (1893), in Durand & Schinz, Consp. Fl. Afr. v. 600 (1895) and Ill. Cyp. t. xxxiii. figs. 1–5 (1908). *Carex tuberosa* Blanco, Fl. Filip. 35 (1837), ed. 3, i. 45, t. 15 (1877), not Degl. *Scirpus plantaginoides* Rottb. Desc. et Ic. 45, t. xv. fig. 2 (1773). *S. plantagineus* Retz. Obs. v. 14 (1789). *S. tuberosus* Roxb. Fl. Ind. (ed. Wall.) i. 213 (1820). *S. tumidus* Roxb. Fl. Ind. (ed. Wall.) i. 215 (1820). *E. tumida* R. & S. Mant. ii. 86 (1824). *E. tuberosa* R. & S. Mant. ii. 86 (1824). *S. interceptus* Roxb. acc. to Nees in Wight, Contrib. Pl. Ind. 114 (1834). *E. austro-caledonica* Vieillard, Ann. Sci. Nat. sér. 4, xvi. 38 (1862) acc. to F. Mueller, Fragm. viii. 239 (1874). *E. plantaginoidea* W. F. Wight, Contrib. U. S. Nat. Herb. ix. 267 (1905). —Southeastern Asia to Madagascar, Philippine Islands, Fiji Islands. INDIA: *Thomson;* Bengal, *Griffith; Wallich* 3454ª. CHINA: Hupeh, *A. Henry* 4247; Pekin (cult.), *Bretschneider* in 1881. JAPAN: Musashi, *Watanabe* in 1888; *Sakuraj* 48. FIJI ISLANDS: *Seemann* 698. PHILIPPINE ISLANDS: Prov. Luzon, Bulacan, *Merrill* 395.

Merrill, Interpret. Herb. Amb. 104 (1917), has discussed in detail the synonymy of this species. It is variable in height and in the septation and rigidity of the culms. The achenes show variation in the surface markings. In *Seemann* 698 (Fiji Islands) the achenes are light-brown, with small but prominent square or slightly elongated cells in 50–60 rows and with blunt scales. In *Merrill* 395 the culm is lax and the pittings on the achene are entirely absent, leaving the achene smooth except for some minute striations. A specimen (*Watanabe* in 1888) from Musashi, Japan, most nearly approaches in its hexagonal pitting and texture of the bristles Clarke's illustration of *E. plantaginea*.[1] It is possible that several entities are involved in this widely distributed species. The edible tubers are raised in large quantities in the Orient.

[1] Clarke, Ill. Cyp. t. xxxiii. figs. 1–5 (1908).

14. E. SPHACELATA R. Br. FIG. 15. Culms exceeding 7 dm. in height, septate at intervals of 1 to 5 cm. with false septa interspersed: spikelets cylindric, 2.5–4 cm. long, somewhat acute: scales obovate to broadly lanceolate, obtuse, about 1 cm. long, light-brown with a deep-brown margin or sometimes with only a dark spot at the apex, scarcely striate, occasionally with a faint nerve in the middle: style 2- or 3-fid: stamens 3: achene 2–2.5 mm. long (not including the style-base), orbicular, light-brown, biconvex, turgid, covered with minute hexagonal or quadrangular reticulations, surmounted by an annular thickening from which rises the deep-brown, flattened style-base: bristles 6–9, about 4 mm. long, much exceeding the body of the achene, light-brown, sparsely toothed.—Prod. 224 (1810); Kunth, Enum. ii. 154 (1837); Hook. f. Fl. N. Zel. i. 269 (1853) and Handb. Fl. N. Zel. 300 (1864); Boeckl. Linnaea, xxxvi. 475 (1869–1870); Mueller, Frag. viii. 239 (1874); Benth. & Muell. Fl. Austral. vii. 292 (1878); C. B. Clarke, Ill. Cyp. t. xxxiv. figs. 1–6 (1909); Cheeseman, Man. Fl. N. Z. ed. 2: 216 (1925). *Scirpus sphacelatus* Spreng. Syst. i. 204 (1825). *E. biseptata* Steud. Cyp. 82 (1855). *E. subsphacelata* Steud. Cyp. 317 (1855). *E. esculenta* Vieillard, Ann. Sci. Nat. sér. 4. xvi. 37 (1862).—Australia, Tasmania and New Zealand. The specimens represented in Gray Herbarium are AUSTRALIA: Austral. felix, *Mueller*. TASMANIA: *Gunn*. NEW ZEALAND: Takapuna, North Isl., *T. Kirk* 208.

Cheeseman (l. c.) considers *E. sphacelata* "an abundant Australian and Tasmanian plant, and very closely allied to the widely diffused *E. plantaginea* R. Br." but the characters which separate the two species are not mentioned. The reticulations are variable and are often quadrate. C. B. Clarke's illustrations (l. c.) of *E. sphacelata* and *E. plantaginea* seem almost identical. In specimens at the Gray Herbarium, *E. sphacelata* is characterized by much larger spikelets, light-brown scales edged with darker brown, and coarser achenes, often with 8 or 9 bristles. F. Meuller (l. c. 239) describes the achene of the Australian *E. plantaginea* as lightly seriate-punctulate, shining-brown, in age becoming very smooth and dark, and with very narrow bristles. *E. sphacelata*, according to Mueller, extends from the Gulf of St. Vincent and Torrens Lake through the whole of Australia (except the West) to the tropic of Capricorn. The achene is round, somewhat compressed, shining, grayish-brown, punctulate, truncate below the style. The spherical starchy tubers, often an inch long, are the most esteemed of all and serve as food for the natives, either fresh or roasted. Vieillard, Ann. Aci. Nat. sér. 4. xvi. 37 (1862), in describing *E. esculenta* (represented by no. 1456 in herb. from New Caledonia) states that the culms are septate, 40–50 cm. high; the

achenes shining-black, and the bristles 8, of unequal length. The tubers are edible. According to Vieillard, these two species, *E. esculenta* and *E. austro-caledonica*, are used by the natives of New Caledonia for making the mantles which they wear during the rainy weather and during the night. These garments, which have the form of a triangular shawl, are woven together on the side next to the body, while the exterior is covered by the ends of the culms, the long stalks overlapping one another. Merrill has included *E. esculenta* as a synonym of *E. equisetina*, but judging from the large size of *E. esculenta* in Vieillard's description, it seems to belong under *E. sphacelata*.

15. E. EQUISETINA Presl. FIG. 14. Culms terete, slender, 5–8 dm. high, 2–3.5 mm. wide, septate, from a short vertical rootstock, with coarse brownish roots: sheaths membranous, usually disintegrating: spikelets 2–4 cm. long, cylindric, acute or obtuse, usually somewhat thicker than the culm: scales 4–5 mm. long, straw-colored, orbicular, with a broad rounded, almost truncate, upper margin, striate, rigid: style 2-fid: stamens 3: achene 2–2.4 mm. long (including the style-base), lenticular, elliptical, the shining brown surface punctulate, narrowed at the base, the summit passing gradually into the flattened dark-brown style-base: bristles 6–7, light-brown, as long as the beak, with soft retrorse teeth.—Rel. Haenk. i. 195 (1828); Steud. Cyp. 82 (1855); C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 626 (1894), in Bot. Tidsk. xxiv. 85 (1901), in Phil. Journ. Sci. Bot. ii. 89 (1907); Merrill, Fl. Manila, 114 (1912), Enum. Phil. Pl. i. 120 (1922). *E. plantaginea* Vidal, Phan. Cuming .Phil. 156 (1855). *E. esculenta* Vieillard, Ann. Sc. Nat. sér. 4, xvi. 37 (1862) acc. to Merrill.—Merrill gives the range as Ceylon to Madagascar, Malaya and New Caledonia. Specimens in the Gray Herbarium are CHINA: Amoy, *Hance* 1391. PHILIPPINE ISLANDS: Manila, Kneucker (coll. *Merrill*) 224; Luzon, Prov. Sorsogon, *Elmer* 14341.

According to Presl, the plant "affinis *E. plantagineae*, differt magnitudine duplo minore, glumis magis subrotundis, stylo bifido, caryopside ancipite setarum longitudine." As represented by the specimens in the Gray Herbarium, the achenes are lenticular, not turgid, and characterized by punctulate, not reticulate, achenes.

SPECIES DOUBTFUL OR NOT SEEN

E. OBTUSETRIGONA (Lindl. & Nees) Steud. Cyp. 80 (1855). *Limnochloa obtusetrigona* Lindl. & Nees in Mart. Fl. Bras. ii.[1] 100 (1842). *E. mutata* var. *obtusetrigona* (Lindl. & Nees) Clarke in Bull. Herb. Boiss. vi. Append. 1, 20 (1898).—BRAZIL.

Steudel (l. c.) notes that Nees has taken this name from Lindley's

herbarium name, but that Nees had never seen the authentic *Salzmann* specimens upon which it was founded.

E. MITRATA (Griseb.) Clarke in Urban, Symb. Ant. ii. 62 (1909) and Ill. Cyp. t. xxxiii. figs. 10–13 (1909). *Scirpus mitratus* Griseb. Fl. Br. W. Ind. 570 (1864).—Clarke cites *Crueger* 24 from Trinidad, and includes as a synonym *E. Jelskiana* Boeckl. Linnaea, xxxviii. 376 (1874).

This species may be *E. plicarhachis* or more probably *E. fistulosa*. Grisebach describes the achene as pale, obovate-roundish, subtruncate and *produced into a tumid ring* around the tubercle, constricted at the base, biconvex, longitudinally 11–13-costate on each side, twice as long as the bristles; tubercle compressed, bluntly conical, nearly half as long as the achene, deciduous.—Based on *Crueger* 24.

E. BRASILIENSIS Boeckl. Cyp. Nov. ii. 13 (1890). "Car. juvenili oblonga obtusa *longitudinaliter striata* fusca; stylo longiusculo complanato apice bifido; perigonii setis 6, caryopsi longioribus. . . .—E vicinia H. elatae Boecklr."—In swamps near Queluz, prov. Minas Geraes, coll. *H. Schenck*.

E. ALTA Boeckl. Cyp. Nov. i. 17 (1888). The achene is not described but the plant is stated to be close to *E. variegata*.—Java, Vulcan Gede, alt. 2400 m.

According to O. Kuntze, Rev. Gen. 757 (1891) it is *Scirpus tetraquetrus* Kuntze (*E. tetraquetra* Nees).

E. NUDA Clarke, Ill. Cyp. t. xxxv. figs. 9–11 (1909).

This occurs in Australia, and is probably close to *E. philippinensis*.

E. COMPACTA R. Br. Prod. 224 (1810).

Bentham (Fl. Austral.) considers it a synonym of *E. variegata*. In the Gray Herbarium is a specimen from India (Punjab, coll. *T. Thomson*) labeled *E. compacta* Br., but this specimen, although superficially resembling members of the series *Mutatae*, clearly is not a member of it.

E. PERUVIANA Clarke, Kew Bull. Add. Ser. viii. 105 (1908) (name only).

I have not been able to find a description of this species.

E. SAGOTII Clarke, Kew Bull. Add. Ser. viii. 20 (1908).—FRENCH GUIANA.

GEOGRAPHICAL DISTRIBUTION OF SERIES MUTATAE

This series comprises about twenty species of mostly coarse perennial plants with prominent stolons, and, in the case of *E. dulcis* of the Orient and *E. sphacelata* of the Australian region, producing

conspicuous tubers which are utilized for food. The plants are always more or less immersed, varying in the mechanical structure of the culm from terete jointed types which have a superficial resemblance to species of *Equisetum*, to sharply triangular or quadrangular forms. They occur chiefly in warm temperate or subtropical regions from which they extend into the tropics and into the cooler temperate regions. The center of distribution is apparently in subtropical and warm-temperate eastern America, but three species occur in temperate North America along the Atlantic Coastal Plain and inland to the Great Lakes or the Mississippi Valley; *E. Robbinsii*, which has the greatest range, extending to Nova Scotia, Ontario and Michigan. In Florida alone there are five distinct species (*E. elongata, E. Robbinsii, E. cellulosa, E. equisetoides* and *E. quadrangulata*). Many are superficially alike and there has been a tendency to consider Old World and New World species as identical. However, *E. fistulosa* seems to be the only one common to both hemispheres.

Explanation of Plate 188

(Achenes × 10)

Fig. 1, Eleocharis equisetoides, Massachusetts, *Morong;* 2, E. interstincta, Cuba, *Wright* 710; 3, E. fistulosa, Ceylon, *Thwaites* 3162; 4, E. quadrangulata, Massachusetts, *Pl. Exsicc. Gray,* 133; 5, E. Robbinsii, Massachusetts, *Fernald,* 16,296; 6, E. elongata, Florida, *Nash* 944; 7, E. plicarhachis, Cuba, *Wright,* 3372; 8, E. mutata, Porto Rico, *Sintenis* 4942; 9, E. philippinensis, Luzon, *Ramos* 1112; 10, E. variegata var. laxiflora, Ceylon, *Thwaites* 3762; 11, E. cellulosa, Florida, *Curtiss* 6540; 12, E. spiralis, Borneo, *Clemens* 9716; 13, E. fistulosa var. robusta, Djur, *Schweinfurth* 2326; 14, E. equisetina, Philippines, *Elmer* 14,341; 15, E. sphacelata, New Zealand, *Kirk* 208; 16, E. dulcis, Japan, *Watanabe.*

(*To be continued.*)

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS

H. K. Svenson

(*continued from page 163*)

Series Pauciflorae

(Plate 189)

a. Scales pale or, if dark, with the culms at least 1.5 dm. high and the achenes 2–3 mm. long. . . . *b.*

b. Scales light-brown or stramineous to chocolate-brown; culms 1.5 dm. or more in height; achenes 2–3 mm. long. . . . *c.*

c. Culms coarse, compressed, 1–2 mm. wide. . . . *d.*

d. Spikelets 9–20 mm. long, 12–20-flowered; culms often rooting at tip. . . . . 18. *E. rostellata.*

d. Spikelets 5–9 mm. long, 9–12-flowered . . . . . 17. *E. pauciflora* var. *Suksdorfiana.*

c. Culms slender, scarcely compressed, less than 1 mm. in diameter. . . . *e.*

e. Beak of achene 1 mm. long; spikelets broadly ovate. 20. *E. macrantha.*

e. Beak of achene not exceeding 0.5 mm.; spikelets ovate. . . . *f.*

f. Rhizomes not forming a dense indurated turf. . 17. *E. pauciflora.*

f. Rhizomes forming a dense indurated turf; culms glaucous and arching. . . . . 17. *E. pauciflora* var. *bernardina.*

b. Scales usually green, often with brown sides; plants always dwarf, 2–5 (rarely –7) cm. high; achenes 1–1.5 mm. long. . . . *g.*

g. Achenes sharply triangular, smooth and shiny; bristles equaling the achene. . . . . 16. *E. parvula.*

g. Achenes with blunt outer angle, minutely verrucose, dull; bristles lacking . . . . . 19. *E. leptos.*

a. Scales dark, reddish-brown to black; culms 2–15 cm. high; achenes 1–1.5 mm. long (Andean species). . . . *h.*

h. Spikelets 8–15-flowered; achenes 1 mm. long, golden-yellow; style-base as wide as the achene.....24. *E. Brehmeriana.*
h. Spikelets 3–8-flowered; achenes 1.5 mm. long....*i.*
i. Scales black; style-base as broad as the apex of the achene 21. *E. albibracteata.*
i. Scales brown; style-base narrower than the apex of the achene, a whitened ridge present at the junction with the body of the achene....*j.*
j. Culms 9–14 cm. long; spikelets 3–5 mm. long; outer angle of achene acute.....22. *E. boliviana.*
j. Culms 1–8 cm. long; spikelets 2.5–3 mm. long; outer angle of achene blunt.....23. *E. nubigena.*

16. E. PARVULA (R. & S.) Link. FIG. 18. Forming mats: roots fibrous, often with minute tuberous stolons: culms capillary (2–7 cm. high), greenish or straw-colored, often spongy and translucent, terete, becoming somewhat striate in drying: upper sheath inconspicuous, membranous; spikelets 2–3.5 mm. long, broadly ovate, 2–9-flowered: scales ovate, scarcely keeled, obtuse or acute, striate and chartaceous, green to yellowish, often dull-brown on the sides; lowest scale empty, half the length of the spikelet: stamens 3: style 3-fid: achenes obovate, 1–1.4 mm. long, straw-colored, equilaterally triangular with prominent angles, smooth and shining, under high magnification sometimes lightly striate-reticulate: style-base very small, triangular, greenish: bristles straw-colored, equaling or exceeding the achene.—Link ex Bluff, Nees & Schauer in Bluff & Fingerhuth, Comp. Fl. Germ. ed. 2. i. part i. 93 (1836);[1] Hook. Brit. Fl. ed. 5. 418 (1842); Palla in Engler, Bot. Jahrb. x. 299 (1889) and in Koch, Syn. ed. 3, iii. 2542 (1907); Hegi, Ill. Fl. Mitteleur. ii. 41, fig. 198 (? 1909). *Scirpus pusillus* Vahl. Enum. ii. 246 (1805); Pursh, Fl. Am. Sept. i. 54 (1816); Torr. Fl. N. Mid. St. i. 46 (1824). *S. fluitans* Spreng. Mant. i. 4 (1807), not L. *S. nanus* Spreng. Pugill. i. 4 (1813); Wallr. Annus Botanicus (Fl. Hal. Suppl. iii.) 7 (1815); Robinson & Fernald in Gray, Man. ed. 7. 189 (1908); not Poir. *S. pollicaris* Del. Fl. Egypte Ill. 50. t. 63, fig. 10 (1813).[2] *S. capillaceus* Ell. Sk. Fl. S.

[1] This is unquestionably the first publication and refers to *Eleogiton parvula* Link, Hort. Berol. i. 285 (1827) with full synonymy. Sprague, Kew Bull. 1920: 72–74 (1920), has compiled a list of the plants published in Bluff & Fingerhuth, Comp. Fl. Germ. ed. 2, overlooked by the Index Kewensis, but *Eleocharis parvula* does not occur in this list.

[2] Pritzel lists only 62 plates. Of the two copies at the Gray Herbarium, one has 62 plates, the other 64 plates. No description accompanies the name in the text, nor is there any reference to the figure, which is in a separate volume, without date. The figure, however, is an excellent one, clearly the species which we are describing, and is accompanied by the name, *Scirpus pollicaris*. Since the text name is a *nomen nudum*, the date of publication of *S. pollicaris* is the date of issue of the plate. Plates 63 and 64 are marked in the upper left hand corner "Flore d'Egypte par M. Delisle (Supplément)," and they were unquestionably completed subsequent to 1813 and probably later than 1817, the date of publication of *Scirpus parvulus*. Monographers who have dealt with plants figured on these plates (there are 34 excellent figures) have invariably omitted the date of issue. The only references which I have been able to obtain are the three following:

(1) Hackel, Flora, lxiii. 475 (1880). Hackel states that the supplementary plates

Car. i. 75 (1816), not Michx. *S. parvulus* R. & S. Syst. ii. 124 (1817); Reichb. Ic. Fl. Germ. viii. fig. 706 (1846); Anderss. Cyp. Skand. 9, t. 1, fig. 20 (1849); Meinshausen, Acta Hort. Petrop. xviii. 258 (1901); Aschers. & Graebn. Syn. ii.[2] 297 (1904); Rouy, Fl. France, xiii. 385 (1912); Birger, Sv. Bot. Tidsk. vi. 608–618, 1 map (1912); Blomgren in Holmberg, Skand. Fl. 310 (1926). *S. humilis* Wallr. Sched. Crit. 27 (1822). *Eleogiton parvula* Link. Hort. Berol. i. 285 (1827). *Limnochloa parvula* Reichb. in Moessl. Handb. ed. 2, iii. 1808 (1829) and Fl. Germ. Excurs. 78 (1830). *Baeothryon nanum* A. Dietr. Sp. Pl. ii. 91 (1833). *B. pusillum* A. Dietr. Sp. Pl. ii. 92 (1833). *Eleocharis pygmaea* Torr. Ann. Lyc. N. Y. iii. 313 (1836). *S. translucens* Legall in Lloyd, Fl. Loire Inf. 275 (1844). *Chaetocyperus pygmaea* Walpers, Ann. iii. 683 (1852–1853), wrongly ascribed to Torrey. *Cyperus parvulus* Missbach & Kraus in Sturm, Fl. Deutsch. ed. 2, ii. 26, t. 7 (1900).—Salt marshes and brackish mud or sand along the seacoast, rare inland in salt lakes, Newfoundland to Louisiana and the West Indies, inland in New York, Michigan, and Minnesota (?), and on the Pacific coast from northern California to Washington and British Columbia;[1] Atlantic coast of Europe north to Norway, and on the Mediterranean coast of Europe and North Africa. Also at Rio de Janeiro, Brazil. Reported by Ascherson and Graebner (l. c.) from South Africa and Japan. The record from South Africa is undoubtedly based on Sprengel, Syst. 205 (1825) "Sc. parvulus R. et Sch. e. *C. B. S.* simillimum habeo" and has not been substantiated. I do not know the source of the report from Japan. The following, from the numerous specimens examined, are cited as typical. NEWFOUNDLAND: Norris Arm, *Fernald & Wiegand*, 755; Stephenville, *Fernald & Wiegand* 2709; Burgeo, *Fernald, Long & Fogg* 111. QUEBEC:[2] Cap à l'Aigle, *Macoun* 69303. NEW BRUNSWICK: Miscou Island, *Blake* 5580; Bathurst, *Fernald & Williams* in 1902; Fairville, *Fernald, Long & Fogg* 112. NOVA SCOTIA: Cape Breton, *Nichols* 1252; Sable Island, *St. John* 1156, *Macoun* 22649; Bridgewater, *Fernald & Long* 23384; Argyle Head,

"Keine Publizität erlangte," and that according to a letter from Ascherson only two examples of these plates exist, one at Montpellier, the other at Paris. (2) Plates 63 and 64 were reproduced, although much reduced in size, by C. & W. Barbey, *Herborisations au Levant*, t. 8 (1882). This reproduction was made by photography from the Montpellier plates. Since 1882 is the date of publication of Barbey's plates, it becomes the date of publication of *Scirpus pollicaris* and other Delile species figured therein. (3) Junk, *Bibliographia Botanica*, 215 (1909) states that in 1895 eleven examples of plates 63 and 64 were sold at auction by Porquet in Paris. This may be the source of plates which I have seen at the Gray Herbarium, Arnold Arboretum, and New York Botanic Garden.

[1] I have seen no specimens from the interior except from New York and Michigan. Reports from the interior of California are based upon *E. Lindheimeri* (Cucamonga, *Bigelow* in 1854) or upon *E. leptos* var. *Johnstonii* (San Bernardino Mts.). See note by P. A. Munz, Bull. So. Calif. Acad. Sci. xxiv. 47 (1925).

[2] *Svenson & Fasset* 980 from Riv. du Loup, Quebec, and 978, 981 and 982 from New Brunswick, issued as *Scirpus nanus* are all diminutive and sterile *Sagittaria graminea*.

Fernald & Long 23385; Weymouth, *Fernald et al* 20171. MAINE: Perry, *Fernald* 1394; Bar Harbor, *Knight* 5307; Wells Beach, *Fernald* in 1898. NEW HAMPSHIRE: Hampton, *E. F. Williams* in 1911. MASSACHUSETTS: Nahant, *Boott;* Barnstable, *Fernald & Long* 18040; Hyannisport, *Greenman* 369; Marthas Vineyard, *Seymour* 1101. RHODE ISLAND: Middletown, *E. F. Williams* in 1909. CONNECTICUT: Stratford, *Harger* in 1900. NEW YORK: Staten Island, *Britton* in 1889; Cayuga Co., Howland Island, *Wiegand, Randolph & Eames* 11437; Onondaga Lake, *Rowlee & H. H. Smith* in 1906. NEW JERSEY: *Green* in 1834; Cape May, *Gershoy* 151. VIRGINIA: York River, *Grimes* 4022. GEORGIA: Tybee Island, Chatham Co., *Harper* 2176. FLORIDA: Titusville, *Nash* 2311; *Chapman* (as *E. pusilla*). MICHIGAN: deer lick near Hubbardston, Ionia Co., *C. F. Wheeler* in 1887 (N. Y.). MISSISSIPPI: Ocean Springs, *S. M. Tracy* 110 (N. Y.); Ship Island, *S. M. Tracy* 5334 (N. Y.). LOUISIANA: La Plaquanim Parish, *A. B. Langlois* in 1884 (N. Y.). CALIFORNIA: Stone Lagoon, Humboldt Co., *J. P. Tracy* 6744 (P.) WASHINGTON: Westport, *J. M. Grant* in 1918 (as *E. acicularis*). BRITISH COLUMBIA: Barclay Sound, Vancouver Island, *J. Macoun* 42 (N. Y.). CUBA: Havana, *Ekman* 767; *Rugel* 905 (without locality). BRAZIL: Rio de Janeiro, *C. Ule* 14356 (U. S.).

Noted originally from the vicinity of Halle, Germany, by Sprengel (1807) who identified it with *Scirpus fluitans* L., but later (1813) published it as *Scirpus nanus*. Wallroth presented an excellent diagnosis of the plant (1805), but in 1822, because of a pre-existing *Scirpus nanus* (Poir. Encyc. vi. 759 (1804) = *Fimbristylis argentea*), described it as *Scirpus humilis*. Due to an existing *Eleocharis nana* Kunth, Enum. ii. 140 (1837), a South American plant, the name *Eleocharis parvula*, originating from *Scirpus parvulus* Roemer & Schultes (1817) and in current usage in Europe, should be maintained. Vahl (1805) described *Scirpus pusillus* from America, based to some extent upon *Scirpus capillaceus* of Michaux (which has since been identified as *Eleocharis acicularis*), but with "culmis teretis" and the achene "acute trigonum" and in the Gray Herbarium is a Beyrich specimen from southern United States labeled "*Scirpus pusillus* Vahl!" This specimen is clearly *Eleocharis parvula*. However, since the name, *Eleocharis pusilla*, was taken up by Robert Brown, Prodr. 225 (1810), it does not become available for use here, whatever may be the status of Vahl's material. Elliott in the *Sketch of the Botany of South Carolina* (1816), p. 75, describes the achenes of *Scirpus capillaceus* as "compresso obovato." I have not had the opportunity of seeing the Elliott herbarium, which is at Charleston,

South Carolina, but the plant described is probably not *Eleocharis parvula*.

The map published by Birger (l. c.) shows in detail the distribution of this species in northern Europe. Confusion in identification has been largely with *E. acicularis* and especially with *E. acicularis* var. *submersa*, but the recognition of *E. parvula* is not difficult if the tubers are present. Glück, Untersuch. ueber Wasser-und Sumpfgewächse, iii. 577 (1911), discusses the culture of this plant, which he was able to grow in fresh water; and *Scirpus parvulus* forma *submersus* Glück, which is always sterile, is described and figured by him (l. c. fig. 104).

17. E. PAUCIFLORA (Lightf.) Link. FIG. 23. Erect, from creeping rootstocks; the stolons often with conspicuously thickened buds: culms slender, 1.5–4 dm. high, striate: sheath 2–3 cm. long, straw-colored or brownish, truncate: spikelets 4–7 mm. long, ovate, 2–7-flowered: scales all flower-bearing, chocolate-brown with pale scarious margins and tip; the two lower larger: stamens 3; the filaments often whitened and elongated: style trifid: achenes obovoid or fusiform, 2–3 mm. long, in cross-section triangular or plano-convex, prominently reticulate with small rectangular cells; the triangular or lanceolate beak tipped by the dark style: bristles slender, irregularly toothed, equalling or exceeding the achene, sometimes poorly developed.—Hort. Berol. i. 284 (1827); Hegi, Ill. Fl. Mitteleur. ii. 40. t. 43, fig. 5 (? 1909). *Scirpus pauciflorus* Lightf. Fl. Scot. ii. 1078 (1777); Hornem. Fl. Dan. xi. fasc. xxxii. 3, t. mdccclxii. (1827); Reichb. Ic. Fl. Germ. viii. 38, figs. 707, 708 (1846); Anderss. Cyp. Skand. 9, t. 1. fig. 21 (1849); C. B. Clarke in Hook. f. Fl. Br. Ind. vi. 654 (1893) and in Engler, Bot. Jahrb. xxx. Beibl. 68: 26 (1901); Aschers. and Graebn. Syn. ii.[2] 296 (1904); Jepson, Fl. Cal. pt. vi. 199, fig. 18 (1922); Blomgren in Holmberg, Skand. Fl. 311 (1926). *S. Baeothryon* L. f. Suppl. 103 (1781);[1] Vahl Enum. ii. 244 (1805). *S. sepium* Honck. Verz. All. Gew. Teutsch. i. 78 (1782). *S. Halleri* Vill. Plant. Dauph. ii. 188 (1787). *S. quinqueflorus* Vitm. Summa Pl. i. 150 (1789). *S. campestris* Roth in Usteri, Ann. Bot. xiv. 18 (1795).[2] *E. Baeothryon*

[1] The specific name *Baeothryon* was founded upon one of the "nomina usualia" of Ehrhart, Linnaeus f. citing "Baeothryon. *Ehrh. phytoph. n. 31.*" The *Phytophylacii* were sets of exsiccatae which Ehrhart issued in 1780 and later. Their names were published in the "Index Phytophylacii Ehrhartiani" in 10 decades, in Ehrhart's Beitraege, iv. 147 (1789). In an autobiographical sketch Ehrhart mentions both the Linnean Supplement and the Phytophylacii (Usteri, Ann. Bot. xix. 5 (1796)). The "decades" were accompanied by the "nomina usualia," which were never intended for scientific use. However, Farwell and also House have taken up one of these names *Trichophyllum* as antedating *Eleocharis*. For a discussion of Ehrhart's names see Barnhart, RHODORA, xxii. 180–182 (1920), and Fernald, RHODORA, xxix. 226 (1927).

[2] Moessler, Handb. 91 (1833) refers to *Scirpus Baeothryon*, α *major* Dreves & Hayne, Choix Pl. Eur. iv. t. 94 (1802) and β *minor* (*S. campestris* Roth, Dreves & Hayne, l.c.

Presl. Fl. Čech. 11 (1819).[1] *Limnochloa Baeothryon* Reichenb. in Moessl. Handb. ed. 2, iii. 1808 (1829) and Fl. Germ. Excurs. 78 (1830). *Clavula Baeotryon* Dum. Fl. Belg. 143 (1827). *Baeothryon pauciflorum* A. Dietr. Sp. Pl. ii. 90 (1833). *Baeothryon Halleri* T. F. Nees, Gen. Germ. Ic. ii. 17 (1843). *E. atacamensis* Philippi, Fl. Atacam. 53 (1860); Boeckl. Linnaea, xxxvi. 454 (1869–1870); Philippi, Anal. Univ. Chil. v. 93 (1896); Barros, Anal. Mus. Nat. Hist. Buenos Aires, xxxiv. 486, fig. 31 (1928). *S. andinus* Philippi, Anal. Univ. Chil. (1873) 554. *Cyperus pauciflorus* Missbach & Krause in Sturm, Fl. Deutsch. ed. 2, ii. 27, t. 7. (1900).—Wet calcareous soil, Newfoundland and Quebec to northern New England, New York, Indiana and Illinois. Also in western United States and western Canada, especially at high altitudes. Europe, Asia and South America. From many North American specimens the following are cited. NEWFOUNDLAND: Straits of Belle Isle, Eddies Cove Brook, *Fernald, Wiegand & Long* 27524; Flower Cove, *Fernald et al* 26328; Bonne Bay, *Fernald & Wiegand* 2712; Bay of Islands, *Mackenzie & Griscom* 10116; Grand Falls, *Fernald & Wiegand* 4757. QUEBEC: Anticosti, *Victorin & Germain* 25779; Magdalen Islands, Grindstone Island, *Fernald et al* 6964; Gaspé Co., Madeleine R., *Fernald, Dodge & Smith* 25497; L'Islet, *Victorin* 3074; Bonaventure Co., New Richmond, *Fernald & Williams* in 1902. NEW BRUNSWICK: Victoria Co., Gorge of Aroostook River, *Fernald* 1395. NOVA SCOTIA: Baddeck Bay, *Fernald & Long* 20180. MAINE: Fort Fairfield, *Fernald & Robinson*, Pl. Exs. Gray. 3; Monticello, *Fernald & Long* 12822; Sangerville, *Fernald* 246. NEW HAMPSHIRE: Stewartstown, *Moore* 3962. VERMONT: Willoughby Mountain, *Tuckerman* in 1859, *Boott* in 1863. NEW YORK: Herkimer County, State Marsh, *Haberer* 1154; Tioga County, Spencer Lake, *Eames & Wiegand* 11438; Cayuga County, Springport, *Eames & Wiegand* 9347; Sodus Point, *Henderson* in 1874; Watertown, *Crawe*. PENNSYLVANIA: Presque Isle, *Garber* in 1869. ONTARIO: Galt, *Herriot* 1; Pt. Colburne, *Macoun* 34565; Point Edward, *Macoun* 34566; Lake Nipigon, *Macoun* in 1884. INDIANA: Lagrange, *Deam* 36640A. ILLINOIS: Ringwood, *Vasey* in 1860–1861. MICHIGAN: Saginaw Bay, *C. K. Dodge* 16; Charlevoix, *Wheeler* in 1892; Sault Ste. Marie, *Churchill* in 1910. WISCONSIN: Door Co.,

t. 95). These plates represent *Scirpus Baeothryon* and *Scirpus campestris*, respectively. According to Dreves & Hayne *S. campestris* is differentiated by (1) smaller size, (2) by the sterile culms which are shorter than the fertile, (3) by the linear spike during flowering, (4) the scales of uniform length, (5) 3 or 4 flowers in a head, etc. From their excellent presentation it appears that *S. campestris* is merely a dwarf state of *E. pauciflorus*.

[1] This combination was incorrectly referred by Presl to Roemer & Schultes, who, Enum. ii. 123 (1817), published *Scirpus Baeothryon*. *Eleocharis Baeothryon* Schultes, Mant. ii. 92 (1824) refers to *Scirpus* no. 6 of Muhlenberg, Desc. Gram. 29 (1817), habitat in New York and "*S. Baeothryo* affinis." It is impossible to identify this plant, although indications point to either *E. pauciflora* or *E. rostellata*. Asa Gray was unable to identify it in the Muhlenberg Herbarium. Torrey Ann. Lyc. N.Y. 315 (1836), through error, cites *Scirpus* no. 7, thereby identifying it with *S. tuberculosus* Michx.

Rowley's Bay, *Pease* 18000. SASKATCHEWAN: Bredenberg, *Herriot* 73106; Cypress Hills, *Macoun* 294 and 298. [NORTH?] DAKOTA: *Leiberg* 1947. ALBERTA: Banff, *Butters & Rosendahl* 1329; Lake Louise, *Macoun* 64180. MONTANA: Monida, *M. E. Jones* 9384 (P). WYOMING: Fort Bridger, *Porter* in 1863; Yellowstone Park, *A. Nelson* 6159; North Park, *Osterhout* in 1896. COLORADO: Sangre de Christo Mts., *Hicks* 82; Ruxton Dell, *Clements* 350; Empire, *Patterson* in 1892; Seven Lakes, *Clements* 479. UTAH: Salt Lake Co., Big Cottonwood Canyon, *Garrett* 1960. BRITISH COLUMBIA: Laggan, *Wheeler* 1057; Glacier Park, *Fogg* 1179. WASHINGTON: Douglas Co., *Leiberg & Sandberg* 416. OREGON: Des Chutes River, *Peck* 9706; Upper Klamath Lake, *Peck* 9494; Crook Co., *Leiberg* 225; Mt. Jefferson, *J. C. Nelson* 2852; Imnaha River, *Cusick* 3127. CALIFORNIA: Soda Springs, *M. E. Jones* in 1881 (P); Summit, Nevada Co., *M. E. Jones* in 1902 (P); Shepherd's Canyon, *M. E. Jones* in 1897 (P); Yosemite Valley, *Bolander* 6236; Desolation Valley, *Smiley* 334; Round Valley, San Jacinto Mts., alt. 8900 ft., *Munz* 6050 (P); Bluff Lake, San Bernardino Mts., alt. 7400 ft., *Munz* 10683 (P). The following specimens have been seen from South America: CHILE: Prov. Nuble, Banos de Chillan, *Werderman* 1297; Prov. Atamaca, Dept. Copiapo, *Werderman* 966; vic. of Porterillos, Dept. Chañaral, *I. M. Johnston* 4711.[1]

Blomgren (l. c.) reports *Eleocharis pauciflora* from Sweden in bogs, wet meadows (especially meadows by the seashore) or moist pastures and roadsides; for the most part on calcareous ground, ascending the lower mountains. In northeastern United States the plant is rare, occurring almost entirely on marl bogs or on wet calcareous ledges.

Although known in Europe from early times it was first adequately described by Lightfoot from the Scottish highlands. It has served as the type of the genus *Baeothryon* of several authors. The achenes vary greatly in length and diameter of the beak, the degree of reticulation and the prominence of the angles. Watson, Bot. Calif. ii. 221 (1880) noted that "The species has usually been included under *Scirpus*, but there appears to be no good reason for separating it from *Eleocharis*, inasmuch as it has all of the characters which distinguish that genus from *Scirpus*. The tubercle is identical in character with that of *E. rostellata* and its allies, and such as is not found in *Scirpus*, where the style is slender and never tubercle-like at base." The tubercle appears distinct in both color and

[1] Specimens collected by Dr. Johnston in Chile were compared by him with the type of *E. atacamensis* in the Philippi herbarium and are the same in height and in form, size, surface and bristles of the achene. I am unable to separate these specimens from *E. pauciflora*.

texture from the body of the achene and the style itself, and a thorough examination of the species of *Scirpus* which might be considered close to this species, has convinced me that *E. pauciflora*s and its allies stand clearly apart from *Scirpus*.

Var. **Suksdorfiana** (Beauverd), n. comb. Erect from a short caudex: culms 2–3 dm. tall, wiry, compressed and conspicuously sulcate, 1 mm. wide: spikelets 5–9 mm. long, 9–12-flowered: achenes as in *E. pauciflorus*.—*E. Suksdorfiana* Beauverd, Bull. Soc. Bot. Genève. sér. 2, xiii. 267 (1922).—In boggy mountain meadows, Washington and Oregon. WASHINGTON: Skamania Co., *Suksdorf* 2237 (TYPE COLL.); Falcon Valley, *Suksdorf* 2537 and 2820; Mt. Adams, *Suksdorf* 90 in 1882 (as *S. pauciflorus*). OREGON: Burns, Harney Co., *L. F. Henderson* 8663, in part. (Herb. Univ. Oregon).[1]

This plant was distributed as a questionable *Eleocharis rostellata* (which it greatly resembles in height, coarseness, and short, thickened rootstock), but was clearly separated by Beauverd from *E. rostellata* by its purple, fibrous roots, variation of spirals in the inflorescence, non-persistent scales, and the number of flowers in a spikelet. However, the short spikelets, purplish roots, the conspicuously reticulated and elongated achenes, and the long slender bristles, show that the affinity of this plant is with *E. pauciflora*. Transitional specimens such as *A. Nelson*, Wyoming in 1902 make it best to treat the plant as a variety of *E. pauciflora*.

Var. **bernardina** (Munz & Johnston), n. comb. According to the original description, it differs from *E. pauciflora* "in its spreading recurved stems, densely caespitose turf-forming habit, and smaller, smoother and less sharply-angled achenes. It grows in the Canadian zone of the San Bernardino Mountains where the frequent colonies are conspicuous because of their gray-green color, low dense growth and sharply defined limits."—*Scirpus bernardinus* Munz & Johnston, Bull. Torr. Bot. Club, lii. 221 (1925).—CALIFORNIA: San Bernardino Co., south fork of Santa Ana River, 8500 ft. (2600 m.), *Munz* 6187 (TYPE in Pomona College Herb.); south fork of Santa Ana River, 8200 ft. (2500 m.), *Hall* 7608; south fork of Santa Ana River, 7600 ft. (2300 m.) *Munz* 10804 (G, P); Pinos, Santa Barbara, *R. Hoffmann* in 1927 (P.).

I think this plant should be regarded as a variety of *Eleocharis pauciflora*. The specimen, *Munz* 10804, in the Gray Herbarium, has achenes somewhat smaller than is usual in the species, but the spikelets do not seem to have been well developed. *Munz* 10683, from the

[1] This specimen was loaned to me by Dr. M. E. Peck. The label carries the notation "has little bulbs of which the white geese seem very fond."

San Bernardino Mountains, distributed as *Scirpus pauciflorus*, has achenes which vary greatly from the normal in being shorter, with a less-extended beak, with prominent almost costulate angles and a peculiar varnished surface. It shows the glaucous coloration and the thickened rootstocks of 10804, but has the upright habit and thickened buds so characteristic of *Eleocharis pauciflora*. I am inclined to treat this plant also as var. *bernardina*, laying stress on the thickened rootstocks, glaucous wiry culms and the short (2 mm. long) achene with the very prominent angles. From this point of view, it may perhaps be considered as a distinct species, but some of the specimens of *Eleocharis pauciflora* collected in the mountains of Colorado, namely *Clokey* 3424 and *Clements* 479 and 350, also have hardened bases and glaucous culms and therefore approach the var. *bernardina*, so that it is difficult to decide definitely the status of the plant. Recently I have received additional material from Dr. Munz. His no. 10804 in the herbarium of Pomona College is abundantly fruiting and the achenes vary from obtusely triangular to biconvex.

18. E. ROSTELLATA Torr. FIG. 17. Erect or arching from a short vertical rootstock; roots thickened, whitish: culms wiry, conspicuously flattened and sulcate 2.5–15(–22) dm. in length, 1–2 mm. wide, often reclining and rooting from the apex: sheaths rigid, truncate or oblique: spikelet spindle-shaped, acute, 12–20-flowered, 8–20 mm. long: scales light-brown, rigid, ovate, the uppermost becoming acute: stamens 3; the filaments often elongated and whitened: style 3-fid: achene obovoid, obtusely triangular or plano-convex, olive, shiny, under magnification lightly reticulate, 2–3 mm. long, narrowed into the obtuse light-green beaked style-base, which is about one-third the length of the achene: bristles firm, regularly toothed, light-brown, equalling the achene.—Fl. N. Y. ii. 347 (1843); Robinson & Fernald in Gray Man. ed. 7: 185, fig. 263 (1908). *E. rostellata* var. *occidentalis* Wats. Bot. Cal. ii. 222 (1880). *E. rostellata* var. *Congdoni* Jepson, Fl. Cal. 196 (1922). *Scirpus rostellatus* Torr. Ann. Lyc. N. Y. iii. 318 (1836).—Salt marshes, Nova Scotia to Florida; rare inland about salt springs and in calcareous bogs in the eastern United States, becoming common in the alkaline regions of the West. Also in Bermuda, Cuba and Mexico. From many specimes the following are cited. NOVA SCOTIA: Yarmouth Co., Sand Beach, *Fernald et al.* 20165; Tusket, *Fernald et al.* 20167; Argyle Head, *Fernald et al.* 23383; Central Chebogue, *Pease & Linder* 20166. MASSACHUSETTS: Medford, *Boott* in 1865; Harwich, *Fernald* 16332; Edgartown, *Seymour* 1606. RHODE ISLAND: Providence, *Olney*. CONNECTICUT: New Haven, *Harger* in 1887. NEW YORK: Conquest, *Wiegand*

5919; Junius, *Wiegand* 1770, *Sartwell;* Penn Yan, *Sartwell;* Bergen Swamp, *Clinton* in 1865, *House* 6529. NEW JERSEY: Hackensack Marshes, *T. F. Allen* in 1863; Atlantic City, *Parker* in 1871. DELAWARE: Appoquinimink, *Commons* in 1866. VIRGINIA: Williamsburg *E. J. Grimes* 2660. FLORIDA: Miami, *Garber* in 1877. ONTARIO: Courtland, *Macoun* 34488; Galt, *Herriot* 39. MICHIGAN: Hubbardston, *Wheeler* in 1890. INDIANA: Houghton Lake, 2 mi. northeast of Culver, *C. C. Deam* 45067. ILLINOIS: Ringwood, *Vasey.* OKLAHOMA: Greer Co., *Stevens* 1016.1; Kiowa Co., *Stevens* 990; Fairvalley, Woods Co., *Stevens* 1652. TEXAS: Hemphill Co., *Eggert* in 1901; *Reverchon* 7 (in 1885); *C. Wright* 709, 1934. WYOMING: Mammoth Hot Springs, *Nelson* 6044. UTAH: Great Salt Lake, *Rydberg & Carlton* 6902; Monroe, *M. E. Jones* 5409b. ARIZONA: Ft. Huachuca, *Lemmon* 2907. NEVADA: Soda Springs, *Shockley* 280. NEW MEXICO: *C. Wright* 1931, 1956. BRITISH COLUMBIA: Kootanie Lake, *Macoun* 7386; Alberni, Vancouver Island, *Macoun* 32,223 (C). CALIFORNIA: San Bernardino, *Parish* 1570, *W. G. Wright* in 1879; Death Valley, *Coville* 586; Owens Valley, *Horn* in 1863; S. Cal., *Parry & Lemmon* 398; Chino Creek, Ontario, *I. M. Johnston* 1137 (P). MEXICO: Sonora, *Thurber* 380; Durango, *Palmer* 189; Puebla, alt. 2120 m., *Arsène* 1474 (U. S.). BERMUDA: *Britton et al.* 1896. CUBA: *C. Wright* 3769. HAITI: *Leonard* 4199.

Described by Torrey from specimens collected by Sartwell at Penn Yan in central New York. Plants from western United States, described as var. *occidentalis* are taller. *C. Wright* 1946 from New Mexico (in Gray Herb.) reaches 19 dm., and Coville[1] mentions a plant with culms 2.23 meters long, but these plants present no other consistent variations. Var. *Congdoni,* reported from California, has a beak and bristles somewhat shorter than the average, but is scarcely distinct. Throughout its range, *Eleocharis rostellata* is variable, especially in the shape of the tubercle, which is at times lanceolate, and again broadly triangular.

19. E. **leptos** (Steudel), n. comb. FIG. 19. Similar to *E. parvula:* erect or arching, from fibrous roots: culms capillary, 3–4 cm. high: spikelets about 3 mm. long, 4–6-flowered, ovate, acute: scales ovate or ovate-lanceolate, membranous, with a scarious margin, and a green keel bordered by brown or purple bands: style 3-fid: stamens 3: achene 1 mm. long, obovate, triangular, the inner face broader and the outer angle obtuse, greenish or light-brown, the surface finely verrucose: bristles wanting.—*Isolepis leptos* Steud. Cyp. 91 (1855). *E. pygmaea* Torr. var. β? *anachaeta* Torr. Ann. Lyc. N. Y. iii. 441 (1836). *Scirpus leptos* Wright in Sauv. Fl. Cub. 176 (1873). *S. parvulus "var."* Boeckl. Linnaea, xxxvi. 478 (1869–1870). *S.*

[1] Coville, Bot. Death Valley Exp., Contrib. U. S. Nat. Herb. iv. 212 (1893).

nanus var. *anachaetus* (Torr.) Britt. Trans. N. Y. Acad. Sci. xi. 75 (1892).—Cuba and Louisiana, westward to Nevada and Mexico and south to Venezuela. LOUISIANA: *Hale* [Red River, acc. to Torrey, Bot. Pac. R. R. Exp. 192 (1857)] (G, N. Y.); near New Orleans, *Drummond* 409, type collection of *E. pygmaea* var. β? *anachaeta* (N. Y.); borders of ponds near James River, *Nicollet* Exp. (N. Y.); NEVADA: Winnemucca, Reno (?), *F. H. Hillman* in 1897 (P). CUBA: *C. Wright* (without number). MEXICO: Tampico, *Palmer* 433; Mazatlan, Sinaloa, *Rose, Standley & Russell* 14105 (N). VENEZUELA: tidal lagoons, Santa Rosa near Maracaibo, *Pittier* 10485 (U. S.) in part (a fragment mixed with *E. maculosa*).

Isolepis leptos was founded on *Parry* 130 from Mexico, which I have not been able to obtain. It was identified by C. Wright with the Cuban plant. Boeckeler, Flora lxiv. 78 (1880) later identified *Isolepis leptos* as a "forma minima" of *Eleocharis triflora*. *E. leptos* has usually been identified with *E. parvula*, but in its almost plano-convex, lightly reticulated achene, without bristles, it appears distinct. In the mountains of western United States it passes into

Var. **coloradoensis** (Britton), n. comb. Coarser and more wiry, but not exceeding 4 cm. in height: spikelets 4 mm. long, and the achenes 1.2–1.5 mm. long.—*Scirpus coloradoensis* Britton, Torreya, iv. 93 (1904).

There is in the Gray Herbarium a specimen of the TYPE collection, *J. H. Cowen* 2576, Shore Lake, Larimer County, Colorado. Although the plant is rather immature the achenes are larger (about 1.2 mm.) than the specimen (*Palmer* 433) from Mexico, and the spikelets are more conspicuously colored with brown. An immature specimen in the Gray Herbarium was collected in IDAHO: *J. F. Macbride* 311, Falk's Store, Canyon Co.

Var. **Johnstonii**, n. var. (FIG. 22), culmis crassioribus, rigidis, compressis, recurvatis; spiculis 4–5 mm. longis; achaeniis 1.5 mm. longis.—Known from a single collection: CALIFORNIA: alkaline shore of Baldwin Lake, San Bernardino Mts. (alt. 7000 ft.), *I. M. Johnston* in 1924 (G, P) (TYPE in Gray Herbarium).

20. E. MACRANTHA Boeckl. FIG. 26. Roots fibrous, brown, rather fleshy: culms soft, erect, striate and sulcate, 8–16 cm. high, about 0.5 mm. in diameter: sheaths firm at the apex, suboblique: spikelets broadly ovate, obtuse, 4–12-flowered, 5–8 mm. long: scales ovate-oblong, acuminate, with brown keel and translucent stramineous sides, spreading and disclosing the achenes: style 3-fid: stamens 3; filaments elongated and flattened: achene obovate, equilaterally triangular, 2.5 mm. long, including the style-base, stramineous; the surface somewhat spongy and finely reticulate: style-base subulate-conic,

nearly 1 mm. long, triangular, with prominent lateral furrows: bristles 3–6, many-toothed, irregular, but not equalling the style-base.—Linnaea, xxxvi. 453 (1869–1870); Boiss. Fl. Orient. v. 387 (1884). *Scirpus hexatrichus* Ehrenberg mss. acc. to Boeckl. (l. c.). SYRIA: "Zwischen die grossen Quelle inter Brumana aus Libanon" *A. Kneucker* in 1904 (G).

Boissier (l. c.) reported it from the littoral region about Beirut (*Ehrenberg*), and added that only one specimen had been seen, and that further observation was needed.

This species is very close to *E. pauciflora*, from which it seems to differ in the larger, broadly ovate heads, and the narrower beak.

21. E. ALBIBRACTEATA Nees & Meyen. FIG. 21. Rootstock extensively creeping, ligneous, brown: culms 2–15 cm. high, slender, rigid and sulcate, sometimes recurved: sheaths deep-brown, with apex oblique and acute, rigid but with a scarious edge; spikelets 2–5 mm. long, broadly ovate, 3–6-flowered, appearing almost black: scales obtuse or acute, striate, shining, black mingled with reddish-brown, sometimes with a whitish region near the margin; the lowest often with a broad greenish midrib: style 3-fid: stamens 3: the filaments flattened and elongated: achene obovoid, trigonous (the abaxial angle obtuse), about 1.5 mm. long, yellow, shining at maturity; the surface somewhat spongy and finely reticulate; the lower part of the style-base thickened and reticulate (triangular in cross-section), as broad as the apex of the achene, the upper part forming a short conical beak: bristles light-brown, strongly toothed, equalling or slightly exceeding the achene.—Nees & Meyen ex. Kunth, Enum. ii. 143 (1837); Linnaea, ix. 294 (1835) *nomen nudum;* Meyen, Reise, 484 (1834) *nomen nudum;* Boeckl. Linnaea, xxxvi. 423 (1869–1870); C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 23 (1901); Hauman & Vanderveken, Phanerog. Arg. i. 208 (1917); Barros, Anal. Mus. Hist. Nat. Buenos Aires, xxxiv. 465, figs. 20a, 20b (1928). *Chaetocyperus albibracteatus* Nees & Meyen in Mart. Fl. Bras. ii.[1] 95. (1842) and Nov. Act. Caes. Leopold Nat. Cur. xix. Suppl. i. 95 (1843) pl. Guianense excl.; Steud. Cyp. 74 (1855) as *C. albobracteatus*. *E. melanocephala* Desv. in C. Gay, Fl. Chil. vi. 175, t. 71, fig. 1 (1853); R. Fries, Alpine Fl. Arg. 169 (1905). *Scirpus melanocephalus* Griseb. Symb. Fl. Arg. 311 (1879). *S. albibracteatus* (Nees & Meyen) Kuntze, Rev. Gen. i. 757 (1891).—Peru (TYPE region: Lake Titicaca[1]) to Valdivia, Chile (acc. to C. B. Clarke), Juan Fernandez, and in the Andes of Argentina. Also in Ecuador (acc. to C. B. Clarke in Engler, Bot. Jahrb., Beibl. 68: 23 (1901), prope Pomasqui, *Sidero* n. 199). —The following specimens have been examined. BOLIVIA: La Paz, *Buchtien* 4481 (U. S.), *Bang* 71[a] (U. S.). CHILE: Prov. Atacama, Dept. Copiapo, common in subalkaline vega, alt. 2500 meters, *I. M.*

[1] Meyen, Reise, p. 484.

Johnston 4840; Dept. Chañaral, in slightly alkaline meadow, *I. M. Johnston* 4710; Dept. Copiapo, in wet meadow, alt. 2200 m., *I. M. Johnston* 4827; Province of Nuble, Baños de Chillan, open grassy flats, alt. 1800–2000 m., *F. W. Pennell* 12409; Valdivia, *Philippi* (U. S.). ARGENTINA: Prov. Jujuy, Moreno, 3500 m. *R. E. Fries* 695 (U.S.).

The first effective publication, Kunth, Enum. ii. 143 (1837), was based upon a fragmentary specimen and is far less satisfactory than the later publication of *Chaetocyperus albibracteatus*. It is unfortunate that the name *E. albibracteata* must be retained instead of the much more descriptive *E. melanocephala*, for although in young spikelets the pallid midrib of the lowest scale may be prominent, in material which I have seen the pale coloration almost entirely disappears when the spikelets are mature. *Limnocharis albibracteata*, cited in synonymy by Kunth (l. c.), was based upon a misreading of *Limnochloa* in Nees' manuscript (*cf.* Nees, Nov. Act. l. c. footnote). The specimens collected by *Johnston* and cited above were compared by him with authentic material in the Philippi herbarium.

22. E. BOLIVIANA Palla. FIG. 25. Culmis fasciculatis, ex rhizomate erecto (ca. 2 mm. crasso), striatis, sulcatis (ca. 0.5 mm. crassis), 9–14 cm. altis, saepe recurvatis; vaginis fuscis ad basin rufescentibus, apice firmis, truncatis vel subobliquis; spiculis 3–5 mm. longis, late ovatis, 4–8-floris; squamis ovatis, acutis, rufescentibus, in carina interdum viridescentibus, infima obtusa, viridi-vittata; stylo 3-fido; achaenio 1.5 mm. longo (cum stylobasi), obovoideo, triangulo, angulis costatis, viridescenti, lutescente, subtiliter reticulato; stylobasi triangulo, conico, ad achaenium annulo toroso angusto albescenti instructo; setis 6, brunneis, retrorsum dentatis, achaenium superantibus. —Palla in Buchtien, Contrib. Fl. Bolivia, i. 88 (1910), name only. BOLIVIA: La Paz, 3750 m., Jan. 1, 1919, *Buchtien* 4482 (TYPE in Gray Herbarium).

The name only is given by Buchtien, and the species was to have been described in an ensuing volume. *E. boliviana* is close to *E. albibracteata*, from which it differs in larger stature, paler spikelets, and more sharply angled achene, with less conspicuous reticulation and much narrower style-base.

23. E. NUBIGENA C. B. Clarke. FIG. 20. Culms 1–8 cm. long, filiform, from a ligneous creeping rootstock: upper sheath truncate, green, firm: spikelets 2.5–3 mm. long, 3–7-flowered, dark-brown, acute or obtuse: scales glossy-brown, with a green midrib, broadly ovate, somewhat acute; the lowest obtuse; style 3-fid; stamens 3: achene obovoid, triangular, with the outer angle obtuse, 1.5 mm. long,

greenish to light-brown, lightly reticulate: style-base triangular-conic, ½–⅓ as wide as the achene, brown, with a whitened ridge at its junction with the body of the achene: bristles 3–4, light-brown, slender, shorter than or exceeding the achene.—C. B. Clarke in Engler, Bot. Jahrb. xxxvii. 518 (1906) and Kew Bull. Add. Ser. viii. 22 (1908); Barros, Anal. Mus. Nat. Hist. Buenos Aires, xxxiv. 485, fig. 30 (1928). *E. crinalis* Griseb. forma *humilis* Boeckl., ex C. B. Clarke, Engler, Bot. Jahrb. xxxvii. 518 (1906).—In the Andes from Ecuador to Argentina. The specimens of *E. nubigena* in the Gray Herbarium are: ECUADOR: *Spruce* 5913 (TYPE COLLECTION); BOLIVIA: Prov. Larecaja, vic. Soratá, alt. 3100–4100 m., *Mandon* 1414 (in part); vic. La Paz, 10,000 ped., *Bang* 71[a].

Spruce 5913 "in Andibus Ecuadoribus" is the type collection. C. B. Clarke also cites specimens as follows: "B o l i v i a: Puna Patanca, 3700 m s m. in locis humidis (FIEBRIG n. 2636, c. fl. mense Januario, 2887); in Andibus (MANDON n. 1413, LORENTZ et HIERONYMUS n. 65)." In Kew Bull. Add. Ser. (l. c.) the editor has cited "Mandon nn. 14, 13" which obviously refers to *Mandon* 1413 or to both 1413 and 1414; and adds the locality "Argentina, Nevado del Castillo" for *Lorentz & Hieronymus*, No. 65. The *Mandon* specimens are notoriously mixed. *Mandon* 1414 in the Gray Herbarium consists in part of *E. nubigena* and in part of a plant with many-flowered spikelets in a juvenile state. *Mandon* 1414 in the Stockholm Museum is a mixture of *E. nubigena* and *Scirpus cernuus* var. *dura*. *Mandon* 1413 in the Stockholm Museum is *E. costulata* Nees & Meyen.

This dwarf, few-flowered plant is closely related to *E. albibracteata*, from which it differs in smaller stature, paler scales, and narrow ridge at the junction of the achene and style-base. None of the specimens which I have seen exceed 5 cm. in height.

24. E. BREHMERIANA Boeckl. FIG. 24. Dwarf; culms numerous, 3–7 cm. high, from an elongated ligneous rhizome, erect or arching, sulcate: sheaths reddish at base; the apex truncate and forming a ferruginous ring: spikelet ovate, 8–15-flowered: scales ovate, obtuse, dark-brown, with a lighter midrib: style 3-fid: stamens 3: achene 1 mm. long, abbreviated-obovate, golden-yellow, shining, with broadly convex sides and prominent angles, the surface lightly reticulate: style-base brown, pyramidal, nearly as broad as the achene, not articulated, but often with a ridge at the junction of the style-base and the body of the achene: bristles 4–6, brown, slender, equalling the achene.—Allg. Bot. Zeitschr. ii. 33 (1896).—Based on *Mandon* 1416 (in part) from Bolivia. The following specimens have been examined. BOLIVIA: Prov. Larecaja, vic. Soratá, 2600–2900 m., *Mandon* 1416

(mixed with *E. Dombeyana*); southern Bolivia, Padcaya, 2000 m. *Fiebrig* 2524 (issued as *Scirpus cernuus* var. *dura*).

This species differs from *E. nubigena* in the larger and broader spikelets, which have a greater number of flowers, although I have not been able to find any with 20–40 flowers as Boeckeler (l. c.) states. The achene is more turgid, golden-yellow, and the style-base broader than in *E. nubigena*.

Species doubtful or not seen

All these are members of a group very complex in the Andes and not well understood.

E. MELANOMPHALA C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 24 (1901); Barros, Anal. Mus. Hist. Nat. Buenos Aires, xxxiv. 469, fig. 21 (1928).—CHILE, Cordillera, alt. 2100 m. Paso Cruz 34° S. lat. *O. Kuntze* no. 30. "Planta, cum nuce magna, *E. atacamensi* primo aspectu similis, differt stylobasi a nuce conspicue distincta."

E. SIMULANS C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 20 (1901) and Ill. Cyp. t. xxxvi, figs. 19–24 (1908). *Scirpus andinus* Phil. Anal. Univ. Chil. 554 (1873).—"Nux obovoidea plano-compressa, apice triangularis; stylibasis vix incrassata, cum apice nucis usa . . . . Inter *Scirpum* et *Eleocharidem* quasi media." "Chile (herb. Delessert); Santiago, Cordillera (PHILIPPI n. 36)."

E. LECHLERI Boeckl. Linnaea, xxxvi. 422 (1969–1870); C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 24 (1901); Barros, op. cit. xxxiv. 471, fig. 22 (1928).—Culms 2–5 cm. long, caespitose: achene trigonous, smooth, yellow, abruptly narrowed at apex, lightly striate: style-base depressed-conic, subdisciform, as wide as the achene.—CHILE: Cordillera del Ranco, *Lechler* 795.

E. PLATYPUS C. B. Clarke in Engler, Bot. Jahrb. xxxiv. Beibl. 78: 3 (1904) and Kew Bull. Add. Ser. viii. 23 (1908).—Culm 10–25 cm. long: spikelet 1.8 cm. long: achene ellipsoid, trigonous: style-base "conica, e cellulis magnis rotundo-ellipticis conspicua, in nuce sessili cum hac fere fusa."—Based upon a specimen collected by *Spruce* near Guano, Ecuador.

Geographical Distribution of Series Pauciflorae

The series *Pauciflorae* comprises about 10 species, which occur in saline or alkaline regions, and, except for a rather phenomenal development in the southern Andes, are confined to the Northern Hemisphere. *Eleocharis pauciflora* is a wide-ranging species of boreal alkaline regions in Eurasia and North America, extending south into the Alps and Himalayas and the high mountains of western

United States, reappearing in the southern Andes at an elevation of 7000–10,000 feet.

In Syria the poorly known *E. macrantha* is probably a derivative of *E. pauciflora.*

E. rostellata, on the other hand, seems to be of southern derivation. Sweeping northward from the West Indies and the Gulf of Mexico it forms extensive turf in the salt marshes along the New England coast as far north as southern Maine, and then reappears in southern Nova Scotia, behaving in this manner as the plants of coastal plain affinity. It then occurs sparingly in marl bogs and about salt springs in New York, Indiana, and Michigan. In the high limestone plateau south of the Mohawk River it is certainly not of recent introduction, but seems to have followed the retreating ice of the Wisconsin glaciation, and lodged in a few alkaline areas.[1] In the western United States it is difficult to separate this species from some forms of *E. pauciflora.*

E. parvula, which may perhaps be considered the most primitive member of the section, is found in saline mud along the Atlantic coast of Europe and North America, and to a more limited extent the Pacific coast of North America, and occupies that practically unchanging habitat, the sea-margin. From this species *E. leptos* seems to have been derived, passing from the smooth and sharply angled achene of *E. parvula,* to a slightly verrucose plano-convex achene. *E. leptos* occupies alkaline places in the interior of southwestern United States and northern Mexico and, like *E. pauciflora* and *E. parvula,* produces conspicuous tuber-like buds.

Explanation of Plate 189

(Habit-drawing × ½; achenes × 15, except fig. 17, × 10)

Fig. 17, Eleocharis rostellata, Connecticut, *Harger* (culms, unusually low), achene, New York, *Sartwell;* 18, E. parvula, Newfoundland, *Fernald & Wiegand* 2709; 19, E. leptos, Mexico, *Palmer* 433; 20, E. nubigena, Ecuador, *Spruce* 5913; 21, E. albibracteata, Chile, *Johnston* 4840; 22, E. leptos var. Johnstonii, California, *Johnston;* 23, E. pauciflora, Newfoundland, *Fernald & Wiegand* 4757 (achene unusually elongate); 24, E. Brehmeriana, Bolivia, *Mandon* 1416; 25, E. boliviana, Bolivia, *Buchtien* 3750; 26, E. macrantha, Syria, *Kneucker.*

[1] Svenson, Effects of Post-Pleistocene Marine Submergence, Rhodora, xxix. 107 (1927).

Series Aciculares

(Plate 190)

a. Culms coarse, 0.5–1 mm. in diameter, usually elongated....*b*.
b. Culms strongly flattened (ancipital), about 1 mm. wide, 2–3 dm. high; apex of sheath scarious; achenes without bristles (No. Am.).....30. *E. Wolfii.*
b. Culms not strongly flattened, about 0.5 mm. thick....*c*.
c. Apex of sheath scarious; bristles exceeding the achene (Mex.) 31. *E. acicullariformis.*
c. Apex of sheath firm, divergent; bristles equaling or shorter than the achene (So. Am.).....32. *E. bonariensis.*
a. Culms capillary, usually dwarf, less than 0.5 mm. in diameter..*d*.
d. Spikelets 8-many-flowered....*e*.
e. Culms 1.5–2 dm. high, finely capillary; spikelets purplish-brown; achenes 0.5 mm. long (No. Am.).....33. *E. Reverchonii.*
e. Culms not exceeding 8 cm. in height (except rarely in *E. acicularis*)....*f*.
f. Rootstocks extensively creeping....*g*.
g. Culms and scales light-green; anthers 0.3–0.4 mm. long; white bristles exceeding the achene.....26. *E. Lindheimeri.*
g. Culms dark-green; scales green, with brown markings; anthers 1 mm. long; bristles usually inconspicuous or wanting.....25. *E. acicularis.*
f. Plants cespitose, annual (?), rarely exceeding 4 cm. in height....*h*.
h. Trabeculae about 15 in a longitudinal series....*i*.
i. Anthers 0.2–0.3 mm. long; achene 0.6–0.7 mm. long 27. *E. cancellata.*
i. Anthers 0.7 mm. long; achene 0.4–0.5 mm. long; scales conspicuously attenuate.....28. *E. brachycarpa.*
h. Trabeculae about 30 in a longitudinal series; anthers 0.4 mm. long; achene 0.7–0.8 mm. long.....29. *E. bella.*
d. Spikelets 3–6-flowered....*j*.
j. Style-base elongate-falcate; achene 1.5–1.8 mm. long (including style-base).....36. *E. stenocarpa.*
j. Style-base not elongate-falcate....*k*.
k. Achene 1.5 mm. long; scales spreading and prominently striate.....34. *E. nervata.*
k. Achene 0.7–1.1 mm. long....*l*.
l. Anthers 0.5 mm. long, prominently apiculate...35. *E. costulata.*
l. Anthers 1 mm. long, not prominently apiculate..25. *E. acicularis.*

VARIETIES AND FORMS OF E. ACICULARIS

a. Bristles, when present, finely capillary, equaling or only slightly exceeding the achene....*b*.
b. Culms capillary (rarely triangular), soft....*c*.
c. Spikelets lanceolate; achenes terete or obscurely triangular; tubercle apiculate; bristles finely capillary, often absent var. *typica*....*d*.
d. Culms much elongated, submersed or with floating tips..*e*.
e. Culms always sterile, growing on the bottom in deep water f. *inundata.*
e. Culms sterile; plants extensively branching.....f. *longicaulis.*
e. Some of the culms fertile, elongated, their tips floating on the surface.....f. *fluitans.*
d. Culms not conspicuously elongated....*f*.

f Culms fertile, dwarf and somewhat rigid, not exceeding 3 or 4 cm. in height.....f. *rigidula.*
f. Culms triangular.....f. *triangularis.*
c. Spikelets linear; culms finely capillary, elongated (So. U. S.) var. *gracilescens.*
b. Culms rigid....*g.*
g. Culms dwarf, sterile, short and thick, transparent, without longitudinal furrows (Boreal and Arctic).....var. *submersa.*
g. Culms rigid, coarsely striate; achenes furrowed and somewhat flattened; tubercle depressed; bristles absent (W. No. Am.).....var. *occidentalis.*
a. Bristles coarse, brown, much exceeding the achenes (E. Asia) var. *longiseta.*

The forms described herein are to be expected under unusual ecological conditions; the varieties are geographical segregates which displace typical *E. acicularis* at the extremes of its range.

25. E. ACICULARIS R. & S. var. **typica.** Usually forming close mats: culms 2–20 (rarely –25) cm. high, capillary, deep-green, usually angular and sulcate: rootstocks capillary, with abundant stolons; roots firm, white: sheaths loose, reddish-striate at base; the apex scarious and somewhat inflated: spikelets ovate to linear, 2–7 mm. long, acute, 3–15-flowered (usually 5–8-flowered): scales ovate-lanceolate, acute, green, with reddish-brown sides and scarious margins, usually only a few subtending mature fruit: achene 0.7–1 mm. long, obovate-oblong, yellow to white or brown, obscurely 3-angled, with many longitudinal ribs and close trabeculae (about 40–50 in a longitudinal series): style-base narrow, somewhat compressed, conical-triangular: bristles 3–4, brownish, very slender, equalling the achene, often wanting.—*E. acicularis* R. & S. Syst. ii. 154 (1817); Kunth. Enum. ii. 141 (1837); Britton, Journ. N. Y. Micr. Soc. v. 104 (1889); Terracciano, Malpighia, ii. 314 (1888); Hegi, Ill. Fl. Mitteleur. ii. 41 (?1909). *Scirpus acicularis* L. Sp. Pl. i. 48 (1753); Aschers. & Graeb. Syn. ii.[2] 303 (1904); Blomgren in Holmberg, Skand. Fl. pt. ii. 309 (1926). *Mariscus acicularis* Moench, Meth. 350 (1794). *Cyperus acicularis* With. Arr. Brit. Pl. ed. 3, ii. 78 (1796);[1] Missbach & Kraus in Sturm, Fl. Deutsch. ed. 2, ii. 23, t. 6, fig. 1 (1900). *E. costata* Presl. Fl. Cech. 11 (1819). *Isolepis acicularis* Schlecht. Fl. Berol. i. 36 (1823). *Scirpus Chaeta* Schultes, Mant. ii. 72 (1824).[2] *Clavula acicularis* and *C. comosa* Dumort. Fl. Belg. 143 (1827). *Scirpidium aciculare* Nees, Linnaea, ix. 293 (1834). *Chaetocyperus acicularis* Nees in Mart. Fl. Bras. ii.[1] 95

[1] Not ed. 1: 78 (1776) as Richter states. Withering notes the "straws and leaves as fine as a horse hair; the former is not 4-cornered, as Hudson said, but though cylindrical it is often compressed and fluted. As the spike is more properly 2-rowed, . . . as Haller observed, it ought, . . . to be considered as a Cyperus; and the absence of hairs or bristles at the base of the seed adds confirmation to this opinion."

[2] Merely a synonym of *S. trichodes* Muhl., which is not identifiable with *S. trichoides* HBK.

(1842) in part; Steud. Cyp. 74 (1855).—ILLUSTRATIONS: Fl. Dan. ii. t. cclxxxvii.; Svensk. Bot. ix. t. 605; Curtis, Fl. Lond. ed. 2; iv. 49;[1] Sm. Eng. Bot. t. 749; Engl. Bot. ed. Syme, t. 1585; Britton & Brown, Ill. Fl. i. fig. 587; Gray, Man. ed. 7, fig. 250.—Widespread at the margins of ponds, rivers and ditches in the Northern Hemisphere, forming marked varieties at the borders of the range. According to Hultén, Fl. Kamt. i. 164 (1927), "from Iceland, northern Scandinavia and northern Perm south to northern Spain,[2] northern Italy, Tauria and Astrakhan; also in Caucasus. Asia: at Obi from about 67° N. lat., at Yeinisei from about 64° N. lat., and from Kamtchatka south to Pamiroalajsk Prov., Yunnan, Kuantung, Corea and Honshu." In the Gray Herbarium typical North American specimens are represented from southern Newfoundland and southern Labrador west to British Columbia, south to Pennsylvania, West Virginia, central Indiana, central Illinois, Iowa, Missouri, Nebraska, northern Wyoming and northern Idaho. From numerous specimens the following may be cited: NEWFOUNDLAND: Grand Falls, *Fernald & Wiegand* 4705; St. Johns, *Fernald & Wiegand* 4701; Whitbourne, *Fernald, Long & Dunbar* 26,326. QUEBEC: *Longueuil, Victorin* 9346; Riv. Goynish, North Coast, *Victorin & Rolland-Germain* 18126; Natashquan, *H. St. John* 90,182; Lac Tremblant, Terrebonne Co., *J. R. Churchill* in 1922. PRINCE EDWARD ISLAND: Grand Tracadie, *Fernald & St. John*, 928. NOVA SCOTIA: Uniacke Lake, Hants Co., *Fernald, Bartram & Long* 23377; Gavelton, Yarmouth Co., *Fernald, Long & Linder* 20150 (bristles lacking). MAINE: St. Francis, *M. L. Fernald* 120. NEW HAMPSHIRE: *E. F. Williams* in 1910; Gorham, *A. H. Moore* 4298. VERMONT: Wallingford, *W. W. Eggleston* 640. MASSACHUSETTS: Plymouth, *Fernald, Hunnewell & Long* 8891 (without bristles). RHODE ISLAND: Providence, *J. F. Collins* in 1892. CONNECTICUT: Southington, *C. H. Bissell* in 1899. NEW YORK: Springport, *A. J. Eames* 9336; Oneida Lake, *J. V. Haberer* 2229. NEW JERSEY: Tenafly, *H. Dantun* 18D; Singac, *H. Dantun* 18C. PENNSYLVANIA: Pocono, *J. W. Harshberger* in 1904. WEST VIRGINIA: Elkins, Randolph Co., *J. M. Greenman* 102. ONTARIO: Niagara, *J. Macoun* 34,563. MICHIGAN: Manistique, *J. H. Schuette* in 1887; Isle Royale, *W. S. Cooper* 266. OHIO: Garrettsville, Portage Co., *R. J. Webb* in 1913. INDIANA: Gibson, *O. E. Lansing* 2835; Raccoon Sta., *E. J. Grimes* 811. IOWA: Story City, *R. Coombs & C. R. Ball* 438; Iowa City, *M. P. Somes* 194. MANITOBA: east of Forest, *Herriot* 43,043. NORTH DAKOTA: Rush Lake, Huron Co., *C. K. Dodge* 15 and 17; Portal, *M. A. Barber* in 1903; Dickinson, *C. F. Wheeler* in 1908. SOUTH DAKOTA: Brookings, *T. A. Williams* in 1891; White Willow Creek, *T. A. Williams* 73. NEBRASKA: lowlands of the Missouri, *F. Clements* 2551; near Thedford, *P. A. Rydberg* 1337. COLORADO: Divide between Colorado Springs and

[1] This plate is not in the 1st edition, but is in the 2nd edition (1835).
[2] Colmeiro, Pl. Hisp. Lus. (1889), includes most of the Spanish peninsula.

Denver, *M. E. Jones* 160 (P). Idaho: Montpelier, Bear Lake County, *Nelson & McBride* 1615; Pend Oreille Riv., *Lyall* in 1861. Wyoming: Sheridan, *A. Nelson* 2269. Montana: Big Fork, *J. Clemens* in 1908. British Columbia: Sicamous, *J. Macoun* 7559.

Regarding its presence in India, C. B. Clarke, Journ. Linn. Soc. xxxiv. 51 (1898) says that the single specimen in herb. Rottler can hardly establish the species there. Cheeseman, Fl. N. Zealand 768 (1906), states that it is not recorded from Australia, but in the Gray Herbarium there is a single specimen from *F. von Mueller* (Victoria) which may be an introduction, since it is identical with the European form. Although Clarke cites the species as occurring in the West Indies, the only representative of the section which I have seen from there is *E. Lindheimeri*. Within the range of the typical plant there are several ecological variations which have received names and which may be summed up in the following five forms.

Forma **inundata**, n. f., sterilis, in strato in aqua profundiore crescente.—*E. acicularis* forma *submersa* Druce, Fl. Berks. 524 (1897); *Scirpus acic.*, f. *submersus* Glück, Untersuch. Wasser-und Sumpfgewächse, iii. 573, fig. 103 (1911); *S. acic.* var. *submersus* Blomgren in Holmberg, Skand. Fl. 310 (1896) in part; not *S. acic.* var. *submersus* Hj. Nilss.

This is the common submersed form growing in water 2–8 meters deep, the culms usually becoming somewhat elongated. As Druce describes it "the muddy bottom is covered with it; in this condition it does not flower. Portions brought up by the tow-rope of canal barges are easily recognized by the rhizome. Careful search along the banks will usually be successful in finding it in a fertile state." It is necessary to give this form a new name, since *S. acicularis* var. *submersus* Hj. Nilsson is to be interpreted as a dwarf plant of boreal distribution.

Forma **fluitans** (Doell.), n. comb. Growing in shallow water; culms elongated and floating, some of them fertile.—*Scirpus acicularis* f. *fluitans* Doell. acc. to Glück, l. c. 575 (1911).[1] *E. acicularis* b. *fluitans* Doell, Rhein. Fl. 160 (1843).

[1] In Doell, Rhein. Fl. 160 (1843), which is earlier than Doell, Fl. Baden, i. 311 (1857) as cited by Glück. Doell did not definitely make this a forma but published *E.* (as *H.*) *acicularis* b. *fluitans* with "f l u t h e n d e T e i c h b i n s e mit schwimmenden Halmen." Glück cites as a synonym *Sc. acicularis* forma *filiformis* Wirtgen, but this combination is likewise incorrectly made by Glück. No direct reference is given, but it is probably based on the "authentischen Exemplare W i r t g e n s (. . . Herbarium plant. crit. etc., . . . Fasic, VI, No. 252)" which, as Glück states, have culms both sterile and fertile, and up to 20 cm. in length. It is apparently what Schur. Fl. Transsyl. 691 (1885) describes as *E. acicularis* a. *fluitans* "rhizomate ramoso fibroso

Forma LONGICAULIS (Desmaz.) Hegi. Sterile, submersed, branched, often up to a meter in length; the long culms and branches elongating in the water.—Ill. Fl. Mitteleur. ii. 42 (1909?).—This form is not uncommon in streams and sometimes in lakes, and, as interpreted by Hegi (l. c.), may perhaps include forma *fluitans*. In discussing this plant, Ascherson & Graebner give the following synonymy: *S. acicularis* β. *longicaulis* Desmaz. Cat. Pl. Omises Belg. 42 (1823). "*Clavula acicularis*" [*C. comosa*] β. *longicaulis* Dumort. Fl. Belg. 143 (1827). *S. acicularis* γ *natans* Schrad. in Lej. and Court. Fl. Belg. i. 40 (1828).[1]

Forma **rigidula** (Reichb.), n. comb. Culms short, at most 3–4 cm. long, rigid.—*Scirpus acicularis* var. *rigidula* Reichb. Ic. Fl. Germ. viii. 37, fig. 697 (1846). *S. acicularis* forma *rigidula* Junge, Cyp. Schleswigs-Holstein, 253 (1908).

Forma **triangularis** (Reinsch), n. comb. Culms triangular.—"*Heleocharis triangularis* Reinsch in Doerfler, Herb. Norm. No. 4 384. Schedae XLIV. 188 mit Holzschnitt (1902)," acc. to Aschers. & Graebn. Syn. ii.[2] 304 (1904). "**H. triangularis** Reinsch in Schedae ad Cent. XLIV des Herbar. normale, p. 108," acc. to Palla in Koch, Syn. ed. 3: 2544 (1905). *S. acicularis* II *triangularis* Aschers. & Graebn. Syn. ii.[2] 304 (1903). *Eleocharis acicularis* var. *triangularis* Rouy, Fl. France, xiii. 364 (1912). *S. acicularis* forma *triangularis* Junge, Cyp. Schlesw.-Holst. 253 (1908).

Montell[2] discusses this plant in detail. The specimens issued by him, which I have seen, are clearly dwarf *E. acicularis*. Since a translation of Montell's paper may not be readily available, I am quoting (in translation) the more important portion:

"On the shores of the river Munio [n. lat. 60, Finland], which are dry at low water, there occurs often in great abundance, a small form of *Heleocharis acicularis*, which has for a long time been considered unusual. Previously it has always appeared in the sterile

ramis longe repentibus. Culmis elongatis flaccidis; spicis minimis paucifloris, 3–5 floris, fuscis.—(Scirpus acicularis var. natans Schrad.—S. pauciflorus *Dumort.* ap. *Bluff.* et *Fingerh.* comp. 1, 1, p. 90.) . . . (S. filiformis *Sauter* dürfte hierher gehören)." The last two specific names are antedated by *S. pauciflorus* Lightf. and *S. filiformis* Lam. In this synonymy should probably be included *E. acicularis* var. β. *longicaulis* H. Watson in C. B. Clarke, Journ. Bot. xxv. 270 (1887) "culmis 3 dm. longis; spicis 7 mm. longis, atropurpureis." *S. filiformis* Sauter seems to be based on Reichb. Ic. Flor. Germ. viii. t. 294, fig. 696, and is what I have considered under forma *fluitans*.

[1] I can find no formal description by Schrader, but the source of this reference may be the supplementary description of *S. acicularis* "in aquis natantes semipedales, pedales, tenuiores" in the extensive treatment of the *Cyperaceae* by Schrader, Fl. Germ. i. 130 (1806). Lejeune and Courtois (l. c.) also describe *S. acicularis* β. *comosus* (*S. comosus* Dumort. in Mich. Agr. no. 268) "Rhizomate valde repente, cespitibus densis. In locis aqua derelictis".

[2] Montell, Mem. Soc. Fauna et Fl. Fenn. i. 43 (1927).

condition, but I have now found it blooming. Microscopic study of living specimens showed that it did not belong to *H. acicularis* in the narrower sense, but to *H. triangularis* described by P. F. Reinsch from Bavaria, which is to be distinguished from true *H. acicularis* (L.) Br. primarily through the structure of the culm. In the new species the cross-section of the culm is more or less triangular, with three air chambers: in true *H. acicularis*, rectangular, six angled, or almost elliptical, with four projections and an equal number of air chambers. These characters, according to Reinsch, are very constant. What the above-mentioned characters signify is not further mentioned in the author's description on labels issued with No. 4384 in Doerfler's 'Herbarium Normale.' Since the form which I have described seems to vary from *H. acicularis* as described in floras, it seems well to give a short description: The culms are merely 1–2 cm. high, occasionally a little taller, arched, capillary, but rather stiff and dark green. The spikelet is only 1–2 mm. long, often only 1–2-flowered."

This form is perhaps a fertile form of var. *submersa*, described below, and except from a purely anatomical point of view, is scarcely worthy of recognition. The mere fact that the culms are triangular is not of great significance; such transitions should be found between the more or less terete culms of dwarf northern plants (cf. var. *submersa*) and the quadrangular culms of the ubiquitous plants which have been accepted as typical *E. acicularis*. In attempting to define just what is typical, the pathway does not seem at all clear. Linnaeus described the culm as terete (Scirpus culmo tereti, Sp. Pl. l. c.) citing as a synonym *Scirpus magnitudine aciculae* of Flora Lapponica. Curtis in the analysis accompanying the plate of *Scirpus acicularis* in Flora Londinensis, ed. 2 (1835) comments as follows: "The culms of *Scirpus acicularis* have by most modern authors been considered tetragonous. Wahlenberg says they are striated; but I, on the other hand, have always found them to be compressed, convex on one side, and channeled on the other."

Var. **submersa** (Hj. Nilss.), n. comb. Culms dwarf, sterile, short and thick, without longitudinal furrows, transparent, simulating *Eleocharis parvula* (*Scirpus nanus*).—*Scirpus acicularis* β. *submersa* Hj. Nilss. Bot. Not. (1888) 144 (1888), not Blomgren. *E. acicularis* f. *submersa* (Hj. Nilss.) Norman, Christ. Vidensk-Selsk. Forh (1893), no. 16: 43 (1893); Ostenfeld, Fl. Arct. i. 42 (1902) excl. desc. in part. *Scirpus acicularis* f. *submersus* (Hj. Nilss.) Porsild, Meddel. Groenl.

l. 370 (1912), not of Glück, Untersuch. Wasser-und Sumpfgewächse, iii. 573, fig. 103 (1911).—This variety is represented in the Gray Herbarium by specimens collected by Porsild in West Greenland, n. lat. 70° 2′, August 10–11, 1921; from Labrador, *Fernald & Long* 27,522 (deadwater at outlet of Trout Pond, Blanc Sablon River); and apparently A. E. & R. T. Porsild in 1928 from Great Bear Lake n. lat. 67° 0′, long. 119° 45′ W. belongs here. The Labrador and Greenland plants appear as boreal segregates.[1] Porsild, Fl. Disko Island, 48 (1926), records it from Western Greenland, n. lat. 68° 20′ to 71° 42′, and mentions that it hibernates "enclosed in ice." Nilsson's description is as follows (translated):

E. ACICULARIS L. Culms 3–10 cm. high, erect, bristle-like, opaque, striate with usually four longitudinal furrows; sheaths mostly reddish.—Common on sandy or muddy shores of ponds, ditches, etc.

β. SUBMERSA. Culms of variable length, often short and thick, green, with whitish lower portion, terete, without longitudinal furrows, transparent, with clearly distinguishable longitudinal and horizontal partitions within. Spikelets rarely developed, usually remaining small, green, and sterile.—Shallow places in ponds and lakes, usually entirely submerged. Several localities in Norway and Sweden.

According to Nilsson the superficially similar *Eleocharis parvula* is to be distinguished by the presence of terminal buds on the stolons, and by the undulate radial walls of the epidermal cells. In *E. acicularis* these radial walls are straight. An illustration of the radial walls of both species will be found in Raunkiaer, *De Danske Blomsterplanters Naturhistorie* i. fig. 204 (1895–1899).

Var. **longiseta**[2] n. var., setis crassis brunneis, achaenio longioribus.—Eastern Asia. JAPAN: Nagasaki, *R. Oldham* 909 (coll. in 1862), TYPE in Gray Herbarium; Musashi, *Sakuraj* 52. LOO-CHOO ISLANDS, *C. Wright* 357. COREA: Port Chusan, *A. Wilford* in 1891; SIBERIA: Amur medius, *Korshinsky* in 1891.

All the material which I have seen from eastern Asia, with the exception of a specimen collected by *A. Henry* in Yunnan belongs to this well-marked variety. The Yunnan specimen, like the majority of European specimens, lacks bristles.

With two exceptions,[3] the European material which I have seen is

[1] Professor Fernald has called my attention to the similar distribution of *Alopecurus aequalis* var. *natans*, an Arctic segregate, occurring at the Straits of Belle Isle, in western Greenland, and in northern Europe.

[2] *E. acicularis* var. *longiseta* appears on a label accompanying *Oldham* 909 from Japan. According to Oliver, Journ. Linn. Soc. ix. 163 (1867), he worked over the Oldham collection, and it was to be further worked over by Maximowicz. I can find no trace of the publication of this variety.

[3] A collection by *Werenskiold* from Aas, Norway, which has coarse bristles equalling the achene and which approaches var. *longiseta;* and a collection from Hungary, Fl. Hung. Exsic. 481 ii. which has bristles half as long as the achene.

without bristles. The North American material from Newfoundland, eastern Canada, New England and New Jersey, has in general very slender, light-brown bristles equaling the achene; but plants from Cape Cod and the adjacent islands and from the sandy ponds of Plymouth County, Massachusetts, invariably have the bristles absent. This lack of bristles occurs sparingly northward, following the usual Atlantic coastal-plain distribution to southern Nova Scotia, the sandy lake-shores of central New Hampshire and the shores of Lake Champlain.

Specimens which I have seen without bristles are as follows. NOVA SCOTIA: Great Pubnico Lake, Yarmouth Co., *Fernald, Long & Linder* 20151. NEW HAMPSHIRE: Ossipee Lake, *A. S. Pease* 17889. VERMONT: Lake Champlain, Orwell, *W. W. Eggleston* in 1899. MASSACHUSETTS: Winter Pond, Winchester, *C. E. Perkins* (in part) in 1881; Arlington or vic., *C. E. Perkins* in 1883; Spot Pond, Stoneham, *W. P. Rich* in 1894; Boott Pond and Great South Pond, Plymouth, *Fernald, Hunnewell & Long* 8890 and 8891; and numerous collections from Cape Cod. The New England specimens are in the extensive collection of the New England Botanical Club.

In typical material from west of New York State, the larger number of specimens appear to have bristles, although there seems to be no regularity as regards geographic distribution.

Var. **occidentalis**, n. var., culmis rigidis, crassioribus, sulcatis et striatis, 4–7 cm. longis; spiculis 3–6 mm. longis, 6–20-floribus; squamis rigidis, brunneis, in carina fuscis; achaenio angulato, 0.9–1.1 mm. longo; stylobasi depressa, latiore quam in typica *E. aciculari;* setis nullis.—*E. acicularis* var. ? Torr. Bot. Pac. R. R. Exped. 192 (1857).[1]—Montana and Wyoming to California and northern Mexico. MONTANA: Bigfork, alt. 3000 ft., *M. E. Jones* 9381 (P), 9382 (P); Polson, alt. 2800 ft., *M. E. Jones* 9383 (P). WYOMING: Nez Perces Creek, *A. & E. Nelson* 6552. IDAHO: St. Anthony, *Merrill & Wilcox* 816; Salmon, Lemhi Co., alt. 4500 ft. *E. B. & L. B. Payson* 1889; Goose Creek, Washington Co., *M. E. Jones* (without number) (P); Montpelier, *Nelson & Macbride* 1615 (P). UTAH: Salt Lake City, *M. E. Jones* 1069 (P) in 1881 (P); Panquich Lake, *M. E. Jones* 6019b (P). NEW MEXICO: Colfax Co., *P. C. Standley* 13931; Raron, B. Mesa, *I. E. Diehl* 98 (P). ARIZONA: White Mts., *D. Griffiths* 5269. CALIFORNIA: Santa Barbara, *Rothrock* 80 (TYPE in Gray Herbarium); near San Francisco, *J. M. Bigelow* in 1853–1854; Yosemite Valley,

[1] "Culmo crasso brevi, spica ovato-lanceolata valde compressa acuta 6–7-flora. Wet places near San Francisco; April 8; not mature. Differs from the ordinary form of the plant in its stout culm (which is 2–3 inches high) and much compressed dark chestnut-colored scales. There are 3 stamens and a 3-cleft style, which has a distinct tubercle at its base; but no bristles were found."

Bolander 6229; Bear Valley, San Bernardino, *S. B. & W. F. Parish* 1061 A; Crescent City, *Abrams & Bacigalupi* 8341 (P); Inglewood, Los Angeles Co., *Abrams* 1451 (P); Bluff Lake, San Bernardino Mts., alt. 5200 ft., *Munz & Johnston* 2903 (P); Bear Valley, San Bernardino, *Abrams* 2092 (P); Tolland, *C. F. Baker* herb. 3094 (P); Tahquitz Valley, San Jacinto Mts., *Munz* 6067 (P). OREGON: *E. Hall* 560. WASHINGTON: Pullman, *E. J. Hardwick* in 1895; W. Klickitat Co., *Suksdorf* 225; Calispel Valley, *F. Kreger* 331. MEXICO: near Colonia Garcia, Chihuahua, *Townsend & Barber* 65; Sierra Madre, Chihuahua, alt. 7,000 ft., *M. E. Jones* in 1903 (P).

This variety, confined to western North America, is distinguished by the rigid culms and scales, larger achenes which are strongly angled and sometimes flattened, and broader more depressed tubercle. *Standley* 13931 and *Rothrock* 80 would readily pass as a species distinct from *E. acicularis,* but in the states of Washington, Oregon, Idaho, and Montana, there seems to be a transition into typical *E. acicularis* The very dwarf plants, *F. M. Reed* 2480, margin of Surprise Lake, elevation 9000 ft., San Jacinto Mts. (Gray Herb.) and *Munz* 6376, sandy shores, Hidden Lake, elevation 8000 ft. San Jacinto Mts. (Herb. Pomona College) probably belong to this variety.

Var. **gracilescens**, n. var., culmis tenuissimis, 1–3 dm. longis, striatis; spiculis linearibus, 3–6 mm. longis, 6–15-floris; squamis ovato-oblongis, acutis vel acuminatis, carinatis, viridibus vel purpureo-striatis, in margine hyalinis; staminibus 1.2 mm. longis; achenio anguste obovoideo, stylobasi conica; setis nullis.—Western Tennessee to Oklahoma and California. TENNESSEE: low woods about Reelfoot Lake, *S. M. Bain* 482. MISSOURI: St. Louis, *Engelmann* in 1845 (TYPE in Gray Herbarium). OKLAHOMA: Hattenville, Ottawa Co., *G. W. Stevens* 2497; Limestone Gap, Indian Territory, *G. D. Butler* 28. CALIFORNIA: Yosemite Valley, alt. 4000–5000 ft., *Abrams* 4657 and probably Mendocino City, *Bolander* 4768; Yosemite Valley, *Torrey* 553.

The Engelmann specimen which has been taken by me as the type bears the annotation by Engelmann, "*Eleocharis* n. sp.? *E. acicularis* Auct. am., culmo tereti etc." It is very distinct from typical *E. acicularis* in its elongated, very slender culms, and in the elongate spikelets. Very little of the material studied has ripe achenes.

(To be continued.)

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS

H. K. Svenson

(*continued from page 191*)

26. E. **Lindheimeri** (C. B. Clarke), n. comb. Fig. 31. Culms matted, 3–8 cm. high, light green, soft and spongy, striate: rootstocks slender and extensively creeping, white or light brown; roots fibrous, white: sheaths membranous, closely investing the culm, fugacious: spikelets ovate, acute, 3–4 mm. long, 6–12-flowered: scales ovate-lanceolate, the lower blunt, green, striate, the upper often strongly keeled at the tip: style 3-fid: stamens 3; anthers 0.3–0.4 mm. long: achenes narrowly obovate, yellowish, about 0.7 mm. long (excluding the narrow conical beak), with elevated longitudinal ridges and about 30–40 close trabeculae in a longitudinal series: bristles usually 4, very slender, white, retrorsely toothed, exceeding the achene.—*E. acicularis* var. *Lindheimeri* C. B. Clarke ex Britton, Journ. N. Y. Micr. Soc. v. 105 (1889) in syn.; *E. acicularis* var. *nana* Torr. acc. to Britton, Journ. N. Y. Micr. Soc. v. 105 (1889) in syn.; *E. acicularis* var. *radicans*[1] Britton, Journ. N. Y. Micr. Soc. 105 (1889); perhaps *S. radicans* Poir.—Michigan, Oklahoma and eastern Texas, west to northern Mexico and southern California. Michigan: Olivet, *H. L. Clark* in 1905 (as *S. nanus*). Oklahoma: moist creek banks, Weathersford, Custer Co., *G. W. Stevens* 910. Texas: *C. Wright; Lindheimer* 315 (without locality) type coll.; in a small stream, Hantsville, Walker Co., *R. A. Dixon* 364. California: Cocomungo, *J. M. Bigelow* in 1854 (as *E. pygmaea* Torr.); San Bernardino, *W. G. Wright* in 1880; Red Hill, Upland, *I. M. Johnston* in 1916 and no. 1176; Claremont, *I. M. Johnston* in 1916 (P); San Antonio Mts., *I. M. Johnston* 1735; sandy bed of Santa Ana River, San Bernardino Co. and vic. of San Bernardino, alt. 1000 ft., *S. B. Parish* 5284. Mexico: Fronteras, Sonora, *C. V. Hartman* 989; sandy margin of Rio Sonora, *G. Thurber* in 1851; vic. of Fuerte,

[1] This plant, as Britton has noted, may be identified with *Scirpus radicans* Poiret, Encyc. vi. 751 ((1804), which was antedated by *S. radicans* Schkuhr (1793), a valid European species. Poiret's plant came from Porto Rico and was characterized by sheaths "membraneus, très-mince, glabre, d'un pourpre-rougatre, un peu striée, tronquée obliquement à son orifice, ou prolongée en une pointe subulée." The spikelet "presqu'ovale, obtus d'un vert-pale, ... les deux inférieures [écailles] en forme de spathe, & presque de la longueur des fleurs." Kunth, Enum. ii. 142 (1837) referred to *E. radicans* the *Sc. radicans* Poir. excl. syn., i.e. excluding *S. atropurpureus*. There are, however, some difficulties involved. The achene clearly places Kunth's plant among the *Aciculares;* but the Mauritius plant with achene "turgide biconvexum" is clearly something else. *E. radicans* Kunth is to be identified as one of the Peruvian species allied to *E. acicularis*. The critical descriptive characters are "squamis carinatis, . . . carina viridi, lateribus hyalino-albidis, omnibus fertilibus: . . . achenio (immaturo) elliptico-oblongo, teretiusculo, transverse striatulo, ecostulato, stramineo-flavido, nitido, basi styli conica fuscescente rostrato; pericarpio membranaceo, laxo; setis 5, retrorsim spinulosis, albidis." I have seen no South American material which approaches the Texan plant.

Sinaloa, *Rose, Standley & Russell* 13586 (U. S.); vic. of Magdalena, Sonora, *Rose, Standley & Russell* 15104.

Readily distinguished by the spongy culm, wholly green scales, and long bristles.

27. E. CANCELLATA S. Wats. Fig. 30. Annual?; dwarf, cespitose: culms 1.5–4 cm. high, radiating from a vertically branched root-stock, capillary, striate and sulcate, light-green: sheaths closely investing the culm, fugacious: spikelets 2–4 mm. long, ovate to ovate-lanceolate, acute; flowers numerous: scales obtuse, striate, green, with a narrow brown line on each side, with margin and tip hyaline, at maturity often exposing the achenes: style 3-fid: anthers 0.2–0.3 mm. long: achenes broadly obovate-pyriform, 0.6–0.7 mm. long (including the small conical style-base), white and shining, with 6 longitudinal ribs and about 15 trabeculae in each longitudinal series, and with conspicuous translucent fenestration between the trabeculae: bristles lacking.—Proc. Am. Acad. xviii. 170 (1883); Hemsley, Biol. Cent. Am. Bot. iii. 455 (1885); Britton, Journ. N. Y. Micr. Soc. v. 105 (1889).—New Mexico to central Mexico. New Mexico: *C. Wright* 1937. This specimen is a dwarf form not more than 1.5 cm. high. It is the "small form" of *E. acicularis* cited by Britton (l. c.) and by Torr. Mex. Bound. Surv. 228 (1859), collected by C. Wright in 1851. Mexico: In paludosis Morales, San Luis Potosi, *Schaffner* 575 (in part) (1876) (the specimen labeled by S. Watson in the Gray Herbarium may be considered as the type); region of San Luis Potosi, alt. 6000–8000 ft., *Parry & Palmer*, 912; wet hollows of mesas near San Luis Potosi, *Pringle* 3269.

In habit similar to *E. bella*, from which it is readily distinguished by the smaller, coarsely trabeculate achenes.

28. E. **brachycarpa**, n. sp. (fig. 34), non cespitosa; culmis 1–7 cm. longis, capillaribus, obscure angulatis; spicula 2–4 mm. longa, ovata, multiflora; squamis viridibus vel fusce stramineis, lanceolatis attenuatis, striatis, in margine scariosis; stylo 3-fido; antheris 0.7 mm. longis; achaenio 0.4–0.5 mm. longo, obovato, fere tereti, longitudinaliter circa 15-trabeculata; stylobasi anguste conica, brunnescente; setis nullis.—Mexico, in the region of the lower Rio Grande. The following specimens are in the Gray Herbarium: *Berlandier* 2496 "in locis paludosis, Matamoros, April 1834" (type in Gray Herbarium); *Berlandier* 2324, "in locis humidis inter San Fernando et Matamoros Feb. 1831"; *Berlandier* 894 "in locis humidis prope Matamoros, Feb. 1831"; *Berlandier* 996, "in locis paludosis de Matamoros a Mueres, April 1834."

This species differs from *E. cancellata* in its non-cespitose habit, flexuous culms, long-attenuate scales, long anthers, and shorter, narrower achenes. *Berlandier* 2324 and 894 are dwarf plants only 1–1.5 cm. high.

29. E. **bella** (Piper), n. comb. Fig. 29. Annual ?; rootstock very short, the plant forming dense round tufts 5–10 cm. in diameter: culms ascending, 2–6 cm. high, light-green, capillary, soft, sometimes angled and sulcate: sheaths loose, inflated at the summit, acute: spikelets 2–3 mm. long, blunt or acute, ovate, many-flowered: scales ovate-lanceolate, keeled at summit, acute, with a broad green midrib and purple-striated sides: style 3-fid: anthers 0.4 mm. long: achene yellowish or white, linear-obovate, 0.7–0.8 mm. long, obtusely 3-angled, with 3 primary and many secondary longitudinal ridges and about 30 trabeculae in each longitudinal series: bristles none.—*E. acicularis* var. *bella* Piper, Fl. Palouse Region, 35 (1901) and Contrib. U. S. Nat. Herb. xi. 160 (1906). *E. acicularis* var. *minima* Torr. in Britton, Journ. N. Y. Micr. Soc. v. 104 (1889). *E. acicularis* Jepson, Fl. Calif. pt. vi. 195, fig. 16 (1922).—Idaho and Washington, south to New Mexico and California. The following specimens have been examined. Idaho: Forks of St. Mary's River, *Leiberg* 1139. Nevada: Truckee River, alt. 4000 ft., *S. Watson* 1211; Silver Mts. 30–40 miles east of Carson City, *Bolander*. New Mexico: Mogollon Mts., West Fork Gila River, *O. B. Metcalf* 588. Arizona: Rucker Valley, *Lemmon* 481. California: Red Clover Valley, Plumas Co., *A. A. Heller & P. B. Kennedy* 8693; Hayden Survey, coll. *Hooker & Gray;* Moulton, Warren Mts. *Griffiths & Hunter* 478; Headwaters of Chico Creek, Butte Co., *A. A. Heller* 11596; 40 miles north of Mt. Shasta, *E. L. Greene* 936; Big Trees, *Hillebrant* 2332; Cayumaca Lake, San Diego Co., *Abrams* 3848, *Munz & Harwood* 7200; Palomar Mts. San Diego Co., *P. A. Munz* 8268 (G. P.); Eshom Valley, Tulare Co. *Clemens* in 1910; Burton Flats, San Bernardino Mts. *Munz* 6317 (P); Soda Springs, Nevada Co., *M. E. Jones* in 1881; Prattville, *M. E. Jones* in 1897; Emigrant Gap, *M. E. Jones* 2905; Kenworthy, San Jacinto Mts. *Munz* 5472; Sisson, *C. F. Baker* 3825. Oregon: near Fort Klamath, alt. 1470 m., *J. B. Leiberg* 650; Swan Lake Valley, Klamath Co., *E. I. Applegate* 769; *E. Hall* 566 (as *E. acicularis* var. *minima* Torr.); muddy flats of the Columbia river, *T. Howell* 609. Washington: Pullman, *C. V. Piper* 3055 (G. P.) (type coll.); Spokane, *C. V. Piper* 2642; Waitsburg, *R. M. Horner* in 1897; Pullman, *Elmer* 11417 (P) and 24 (P); springs, W. Klickitat Co., Cascade Mts., *Tweedy* 42.

This species is readily distinguishable from *E. acicularis* by the cespitose habit and the minute anthers, and from *E. cancellata,* of similar cespitose habit, by the larger achenes and close trabeculae. *E. Hall* 566 seems to have had the tops chewed off, forming unusually dwarf plants.

30. E. Wolfii A. Gray. Fig. 36. Culms sparsely caespitose, from slender creeping rhizomes, 1.5–3 dm. high, about 1 mm. in diameter, two-edged, often concavo-convex or inrolled, lightly striate:

sheath oblique and scarious at the apex: spikelets slender-ovoid, acute, 5–9 mm. long: scales oblong-ovate, acute, purple-striate, with scarious margin: style 3-fid: anthers 3, 1 mm. long: achene pyriform, light-brown, shining, 1 mm. long, strongly costulate with 9 longitudinal ribs and about 40–45 trabeculae in each longitudinal series: style-base depressed-truncate, with an apiculate center: bristles lacking.—A. Gray in Patterson, Cat. Pl. Ill. 46 (1876); Britton, Journ. N. Y. Micr. Soc. v. 105 (1889); Britton & Brown, Ill. Fl. i. 252, fig. 588 (1896); Robinson & Fernald in Gray, Man. ed. 7: 183, fig. 251 (1908). *Scirpus Wolfii* A. Gray, Proc. Am. Acad. x. 77 (1875). —Margins of ponds and in wet meadows, Indiana to Kansas and Louisiana. Indiana: Hanover, Jefferson Co., *C. C. Deam* 38893; Illinois: Canton, *J. Wolf* (type in Gray Herbarium); *E. Hall* in 1861; Wady Petra, *V. H. Chase* 1451, and 191 in Kneucker Cyp. and Junc. Exs. Iowa: Emmett Co., *I. A. Cratty* in 1882. Louisiana *J. Hale*. Kansas: Cherokee Co., *A. S. Hitchcock* 1050.

Approached in size only by *E. bonariensis* to which it is united by C. B. Clarke, but readily distinguished by the rigid ancipital culms which are usually provided with minute tooth-like elevations at the margins. This condition is unique in the genus, and resembles to some extent the toothed culms of *Fimbristylis*. These ancipital culms may become inrolled to such an extent that they appear almost cylindrical in cross-section.

31. E. acicullariformis Greenman. Fig. 37. Rhizome 1–2 mm. in diameter, branching, light-brown: culms 5–8 cm. high, 0.5 mm. thick, rigid, sulcate, tufted at the nodes of the rhizome; sheaths reddish, striate below, green above, with acute scarious apex: spikelets elliptic-ovate, 4–6 mm. long, about 12-flowered; scales ovate, obtuse, reddish-brown, with green keel and scarious margin: style 3-fid: stamens 3; anthers about 1.2 mm. long: achene oblong-obovate, 1.2 mm. long, rather sharply narrowed at the summit, somewhat compressed, with numerous longitudinal ribs, and about 60–70 very close trabeculae in each longitudinal series: style-base conical, about ⅓ as broad as the achene: bristles 3, white, retrorsely toothed, slightly exceeding the achene.—Proc. Am. Acad. xxxiv. 566 (1899).

Known only from a single collection, *Pringle* 6818, Federal District, Mexico, May 7, 1898. It differs from *E. acicularis* in stouter habit and thickened rhizome, more conspicuously sheathed culms, and white, more closely toothed bristles, and in the larger achenes. It might be confused with *E. bonariensis*, of similar large stature, but may be readily distinguished from that species by the scarious sheath-apices.

32. E. bonariensis Nees. Fig. 32. Rootstocks creeping, 1–1.5

mm. thick: culms fascicled, somewhat rigid, 1.5–4 dm. high, about 0.5 mm. wide, bright-green or yellowish, striate and sulcate: sheaths yellow or brown, often reddish at the base; the firm apex obtuse, elongated and spreading: spikelets lanceolate, 4–8 mm. long, the lowest scale about half the length of the spikelet: scales ovate-lanceolate, obtuse or acute, green, with reddish sides: style 3-fid: stamens 3, anthers 1.5 mm. long: achene elliptic to narrowly obovate, 1–1.3 mm. long, with many longitudinal ribs and about 50–60 trabeculae in each longitudinal series; style-base small, conical, ⅓ as wide as the achene: bristles 3 or 4, white, sharply toothed, equalling the achene, or somewhat shorter.—Nees in Hook. Journ. Bot. ii. 398 (1840); Hauman & Vanderveken, Phanerog. Arg. i. 208 (1917); Barros, Ciperac. Arg. 19, t. 2, fig. 8 (1925). *E. striatula* Desv. in C. Gay, Fl. Chil. vi. 173, t. 71, fig. 3 (1853); Boeckl. Linnaea, xxxvi. 432 (1869–1870). *E. oxyneura* Durieu, Bull. Soc. Bot. France, ii. 609 (1855). *E. amphibia* Durieu, Act. Soc. Linn. Bord. xxi. 487, t. 2 (1858); C. B. Clarke, Journ. Bot. xxv. 270 (1887); Beille, Bull. Soc. Bot. France, xlix. p. xl., t. 4 (1902); Husnot, Cyperac. t. xvii. (1905–1906).—The following specimens have been seen. ARGENTINA: Pergamino, Prov. Buenos Aires, hab. in lagunas, *Parodi* 7167 (*E. bonariensis* det. Barros). CHILE: Limache prov. Valparaiso, agua del rio, *Looser* 124; Jorquera, Dept. Copiepo, Atacama, *Gijoux* in 1886; Valdivia, *O. Buchtien* in 1896 (*E. striatula* det. Buchtien). FRANCE: near Bordeaux, *E. Cosson* in 1859; vases de la Gironde submergées à chaque marée à La Bastice, vis-a-vis Bordeaux, *L. Mately* in 1860; Bordeaux, *C. J. Pittard* in 1903.

Britton, Journ. N. Y. Micr. Soc. v. 105 (1889) cites *Mueller* 1973 from Orizaba, Mexico, as this species.

According to Desvaux (l. c.) *E. striatula* differs from *E. costulata* in size and softness of the culms; the spikelets of the former are much larger, almost linear; the achenes elliptic, 1½ times larger; the style is much larger and the linear elongate anthers are twice as large. *E. amphibia* was discovered in 1851 in the environs of Bordeaux by Durieu de Maissonneuve, and in 1859 was recognized by Cosson as probably identical with *E. striatula* Desv. "This American species has been introduced by shipping" (Beille, l. c. p. xlii), and has become naturalized on the shores of the Garonne near Bordeaux. The original name, *E. oxyneura*, was changed by its author to *E. amphibia*.

Equalled in size only by *E. Wolfii*, from which it is readily distinguished by the softer culms, and by the achenes.

33. **E. Reverchonii**, n. sp. (FIG. 27), gracillima culmis capillaribus. elongatis, 8–20 cm. longis, sulcatis: spiculis 2–4 mm. longis, purpureo-brunneis, ovatis vel ovato-lanceolatis, acutis multifloris: squamis

ovatis, obtusis, purpurascentibus, in carina fuscis et in margine hyalinis; achaenio 0.5 mm. longo, obovato, basi et apice angustate longitudinaliter 9-striato, inter singulas strias transversim ca. 20-trabeculato; stylobasi conica; setis nullis.—Western Texas: *E. Reverchon* (type in Gray Herb.); in locis humidis de Goliad a Bexar, Maio 1834, *Berlandier* 2435 and 1005; San Antonio, *J. Clemens* 382 (P); Dallas, *Reverchon*, and Dalton, *Reverchon* 2451 (both at Mo. Bot. Gard.).

This species may be recognized by the long capillary culms, purple ovoid spikelets, and the minute achenes. None of the Berlandier plants have mature fruit. Reverchon's specimens at the Missouri Botanic Garden, which Dr. J. M. Greenman has kindly loaned me, are all shorter than the plant here illustrated.

34. **E. nervata**, n. sp. (fig. 33), rhizomatibus elongatis, gracillibus, albidis; culmis non-rigidis, 3–9 cm. longis, obscure striatis angulatisque; vaginis superioribus adpressis, membranaceis et marcescentibus, flavidulis, ad apicem hyalinis; spiculis ovatis, 2–3 mm. longis, 3–5-floris; glumis ovatis, acutis vel obtusis, maturitate divergentibus, carinatis, prominenter striatis, viridibus vel interdum lateribus rufescentibus; stylo 3-fido; staminibus 3; antheris 0.7 mm. longis; achaenio 1.5 mm. longo, anguste obovato, longitudinaliter costulato, et inter singulas costas ca. 60–70-trabeculato; stylobasi conica; setis 3, achaenio vix aequilongis.—Mexico: vicinity of Puebla, September 30, 1906, *Arsène* 217 (from which the present description is drawn); vic. of Puebla, *Arsène* 1159 (a dwarf form); San Luis Tultilanapa, Puebla, *Purpus* 3593; Orizaba, *Botteri* 771 (young specimens). Ecuador: vicinity of Huigra, *Rose* 22415.

This species is characterized by extensive white rootstocks, few-flowered spikelets, and spreading prominently striate scales. Although the achene is of approximately the same size and shape as in *E. aciculariformis*, the plant appears distinct from that species. Much of the Mexican material which I have seen and which is possibly referable to this species, is not satisfactorily determinable due to poor material or the lack of sufficiently developed fruit, and it is probable that when a large amount of good material has been studied, the conception of the species will require modification.

35. E. costulata Nees & Meyen. Fig. 28. Dwarf; culms 2–4 cm. high, rigid, striate and sulcate, sometimes recurved: sheaths scarious at the apex, dilated, often 2-lobed: spikelets 2–3 mm. long, ovate or lanceolate, 3–6-flowered: scales oblong, blunt or acute, striate, green (rarely with a brown strip on each side): style 3-fid: stamens 3; anthers about 0.5 mm. long, with a constricted apex: achenes 1 mm. long, oblong-obovate, yellowish-green, shining, triangular,

with about 12 elevated longitudinal ribs, and about 40 trabeculae in each longitudinal series: style-base narrow, conical, acute: bristles 2, white, slender, half as long as the achene, sometimes wanting.—Nees & Meyen ex Kunth, Enum. ii. 142 (1837); Desv. in C. Gay, Fl. Chil. vi. 172, t. 71, fig. 2 (1853); Boeckl. Linnaea, xxxvi. 433 (1869–1870) in part.[1] *Chaetocyperus costulatus* Nees & Meyen in Mart. Fl. Bras. ii.[1] 95 (1842) and Nees, Nov. Act. Acad. Caes. Leopold Nat. Cur. xix. Suppl. i. 96 (1843). *Scirpus costulatus* (Nees & Meyen) Kuntze, Rev. Gen. i. 757 (1891). *E. acicularis* C. B. Clarke in Engler, Bot. Jahrb. xxx. Beibl. 68: 21 (1901); Barros, Anal. Mus. Hist. Nat. Buenos Aires, xxxiv. 448, fig. 10 (1928).[2]—The following have been examined. CHILE: Raucagua, in turfosis inundatis paludosisque, *Bertero* 620 (1835); Valdivia, *Philippi* (U. S.); Bureo, *Claude Joseph* 3480 (U. S.). BOLIVIA: Mapiri, *Bang* 1503; Prov. Larecaja, vic. Sorata, alt. 3100 m., *Mandon* 1413 (not *E. nubigena* as cited by C. B. Clarke in Engler, Bot. Jahrb. xxxvii. 518 (1906)); Comarapa, Dept. Santa Cruz, alt. 2800 m., *J. Steinbach* 8521.

The type locality is in the Andes of Chile "in Cordillera de St. Fernando ad Flumen Tinguiririca . . . 3000′ altit."

Distinguished from *E. acicularis* by the dwarf, rigid, light-green culms, prominent sheaths, striate green scales, short apiculate anthers, and elevated longitudinal ribs on the achene. The style-base sometimes shows a tendency to become falcate. *E. rivularis* Phil. may be a synonym.

36. E. **stenocarpa**, n. sp. (fig. 35), rigida; culmis 6–9 cm. longis, striatis et sulcatis, glaucescentibus; vaginis in apice hyalinis, obliquis, attenuatis; spiculis 3–5 mm. longis, ovatis, acutis, 4–6-floris, glumis maturitate divergentibus; glumis viridibus, oblongis, striatis, ca. 3 mm. longis, carinatis; stylo 3-fido; staminibus 3, antheris ca. 1 mm. longis; achaenio anguste obovato, 1.5–1.8 mm. longo (cum stylobasi), flavescenti, longitudinaliter multicostato et inter singulas costas transversim ca. 60–70-trabeculato; stylobasi falcato, ca. 0.5 mm longo; setis 2 vel 3, crassis, albis, achaenium superantibus. —COLOMBIA: Dept. Santander, Rio Surata Valley above Surata, alt. 2000 ft., *Killip & Smith* 16708 (TYPE in Gray Herbarium). VENEZUELA: Merida, *Pittier* 12881 (U. S.).

[1] Boeckeler cites it from "Chili. Peruvia. Brasilia. America boreal., Boston (Greene, sub. '*Scirp. submersus*')." *Scirpus submersus* is merely a manuscript name, and the plant is presumably *E. acicularis*, with the remote possibility of its being the submersed state of *E. Robbinsii*.

[2] "In *E. aciculari* Europaea, culmi in rhizomate repente distanter fasciculati, setacei aut capillacei videntur; forma, in Chili rarior, in herb. Philippi adest. *E. costulata* (Neesii! exemplum typicum) ab exemplis debilibus *E. acicularis* Europeae nullo modo differt. In *E. costulata* Desv., culmi dense caespitosi, robustiores, glumae non maculatae; forma in Chile frequens ab Argentina usque ad Texas et Californiam sparsa."—Clarke, l. c. 22.

Most closely related to *E. costulata* from which it may be recognized by larger size, and by the larger achenes with elongated falcate beak and course elongated bristles. The Columbian *E. stenocarpa* was collected on the Eastern Cordillera, whereas *E. exigua* HBK. and *E. trichoides* HBK., closely related to *E. stenocarpa* and possibly identical with it, were collected on the Middle Cordillera.

SPECIES DOUBTFUL OR NOT SEEN

E. RIVULARIS Philippi, Linnaea, xxxiii. 270 (1864–1865). Differs from *E. striatula* Desv. in lower culms, shorter spikelets (4–7-flowered), and dark-purple scales; bristles 5–6, much longer than the achene.—At the banks of the R. Aconcagua near S. Rafael below Santa Rosa, Chile (*Philippi*).

E. EXIGUA (HBK.) R. & S. Syst. ii. 154 (1817). *Scirpus exiguus* HBK. Nov. Gen. et Sp. i. 225 (1816).

E. TRICHOIDES (HBK.) Kunth, Enum. ii. 141 (1837). *Scirpus trichoides* HBK. Nov. Gen. et Sp. i. 225 (1816), not *S. trichodes* Elliott, Sk. 76 (1816)[1] nor *S. trichodes* Muhl. Desc. Gram. 30 (1817).

E. PUSILLA R. Br. Prod. 225 (1810), and E. ATRICHA R. Br. l. c. (1810). C. B. Clarke, Kew Bull. Add. Ser. viii. 105 (1908) includes both of these under the *Aciculares*, but from the description by Mueller, Frag. Phytog. Austr. viii. 252 (1874), *E. atricha* would seem to belong to some other group.

GEOGRAPHICAL DISTRIBUTION OF SERIES ACICULARES

This series has its great development in southwestern United States, Mexico, and the Andes, where all of the species of the series are found, with the exception of the questionable *E. pusilla* R. Br. of Australia. Extending, at least in a varietal category, through nearly the whole of the United States and Canada, *E. acicularis* penetrates beyond the Arctic Circle in the Mackenzie Valley and in Greenland and spreads through a large part of Eurasia. A single specimen

[1] *Scirpus trichodes* Elliott is *E. acicularis.* A spikelet from the type has been examined through the kindness of Miss Laura M. Bragg of the Charleston Museum. Although 1821 appears on the title page of Elliott's work, the actual date of issue of the parts was earlier (See Barnhart, Bull. Torr. Bot. Club xxviii. 680 (1901)). *Scirpus trichoides* H. B. K. appeared in May, 1816; *Scirpus trichodes* was published by Elliott in September, 1816. The effective publication of *E. trichodes* Muhl. dates from 1817. Although there is a difference in spelling, both specific names are derived from the same source, and should be considered as homonyms. *Scirpus trichodes* Muhl. has been identified by Torrey, Ann. Lyc. N. Y. iii. 308 (1836) with *S. acicularis. S. capillaceus* Michx., "*Hab.* in nova Anglia," has been identified in the Michaux herbarium by Professor Fernald as an aquatic state of *E. acicularis. S. trichoides* was included by Nees in the mixed species, *Chaetocyperus polymorphus* Nees, Linnaea, ix. 289 (1834).

which I have seen from Australia seems to be the same as the European plant, and may possibly have been introduced. *E. bonariensis*, widely distributed in South America (in Argentina and Chile), is apparently naturalized in the region of Bordeaux (as *E. amphibia*), and has a counterpart in *E. Wolfii* of the Mississippi Valley. I have seen only one specimen (*E. Lindheimeri*) of this series from the West Indies, and the group is poorly represented in, if not entirely absent from eastern South America. *E. retroflexa* (Poir.) Urban has frequently been incorrectly determined as *E. acicularis*.

Explanation of Plate 190

(Achenes × 15)

Fig. 27, Eleocharis Reverchonii, Texas, *Reverchon;* 28, E. costulata, Chile, *Bertero* 620; 29, E. bella, Washington, *Piper* 3055; 30, E. cancellata, Mexico, *Pringle* 3269; 31, E. Lindheimeri, Texas, *Lindheimer* 315; 32, E. bonariensis, Chile, *Barros* 7167 (achene); 33, E. nervata, Mexico, *Arsène* 217; 34, E. brachycarpa, Mexico, *Berlandier* 2426; 35, E. stenocarpa, Colombia, *Killip & Smith* 16,708; 36, E. Wolfii, Illinois, *Wolf;* 37, E. acicullariformis, Mexico, *Pringle* 6818; 38, E. bonariensis, Chile, *Buchtien* (habit).

Series Ovatae[1]

a. Tubercle (style-base) nearly or quite as broad as the achene; stamens 3....*b.*

b. Spikelets broadly ovoid to cylindric, obtuse to subacute; scales obtuse; tubercle depressed or deltoid, rarely ½ as high as the body of the achene....*c.*

c. Tubercle deltoid, compressed (lamelliform), the sides usually concave, ⅓–nearly ½ as high as the body of the achene; bristles (wanting in var. *Peasei*) much exceeding the achene
41. *E. obtusa.*

c. Tubercle lamelliform, very low, not more than ¼ as high as the body of the achene; summit of achene appearing truncate; bristles equaling the achene or rudimentary .38. *E. Engelmanni.*

b. Spikelets lanceolate, acuminate; scales acute; tubercle elongate-deltoid, ½ as high as the body of the achene.....37. *E. lanceolata.*

a. Tubercle less than ⅔ as broad as the achene; stamens 2 or 3....*d.*

d. Tubercle depressed-turban-shape, broader than high; bristles wanting or rudimentary; scales greenish or dull-brown; stamens 2 .....39. *E. diandra.*

d. Tubercle deltoid, higher than broad; bristles much exceeding the achene; scales purplish-brown; stamens 2 or 3.....40. *E. ovata.*

37. E. lanceolata Fernald. Culms slender, almost capillary, erect, 2 dm. high: spikelets many-flowered, 5–8 mm. long, narrowly ovate-lanceolate, acuminate; scales scarious, acute, light-brown, with a greenish midrib: achene broadly obovate, 1 mm. long, light-brown: style-base as broad as the summit of the achene, compressed, elon-

[1] Since the species of Series *Ovatae* were illustrated in Fernald, Proc. Am. Acad. xxxiv. no. 19—Contrib. Gray Herb. n. s. no. xv. (1899), it is unnecessary to illustrate them here.

gate-deltoid, half as high as the body of the achene: bristles 6–7, brown, coarse, exceeding the achene.—Proc. Amer. Acad. xxxiv. 493, figs. 27–29 (1899); Small, Fl. Se. U. S. 183 (1903). *Trichophyllum lanceolatum* House, Am. Midl. Nat. vi. 205 (1920). Arkansas: Central Arkansas, July, 1882, *F. L. Harvey* 8 (type in Gray Herb.). Texas: Texarkana, *A. A. & E. G. Heller* 4102; near Texarkana, alt. 3000 ft., *A. A. Heller* 4144 (P). This little-known species is apparently restricted to Arkansas and Texas.

38. E. Engelmanni Steud. Resembling *E. obtusa* in habit; the culms 1–4 dm. long: spikelets brownish, cylindric, 5–16 mm. long, usually acute: scales obtuse, appressed: achenes similar to those of *E. obtusa* but appearing truncate, due to the depressed tubercle not more than ¼ the height of the body of the achene: bristles about equalling the achene, retrorsely toothed.—Steud. Cyp. 79 (1855); Britton and Brown, Ill. Fl. i. 251, fig. 585 (1896); Fernald, Proc. Amer. Acad. xxxiv. 495, figs. 37–40 (1899); Robinson & Fernald in Gray, Man. ed. 7: 183, fig. 248 (1908). *E. obtusa* var. β. Torr. Ann. Lyc. N. Y. iii. 304 (1836). *E. ovata* var. *Engelmanni* Britton, Journ. N. Y. Micr. Soc. v. 103 (1889). *Trichophyllum Engelmanni* Farwell, Rep. Mich. Acad. Sci. xxi. 359 (1920).—In clay and on sandy pond-shores, rather rare, from southern Maine to Oklahoma and Missouri. Maine: exsiccated depressions in clay fields, Falmouth, *Fernald, Long & Norton* 12793. Massachusetts: Sluice Pond, Lynn, *H. A. Young* in 1880; Winter Pond, Winchester, *A. S. Pease* 11349 (N. E. B. C.); hill at Waltham, *E. Tuckerman* (N. E. B. C.); West Somerville, *C. E. Perkins* in 1881 (N. E. B. C.); Needham, *T. O. Fuller* (N. E. B. C.); pond at Mill Street, Westwood, *Wiegand & Heatley* in 1908 (N. E. B. C.); clay pit, West Barnstable, *W. P. Rich* in 1911. Rhode Island: Westerly, *Fernald & Ware* in 1919. Connecticut: West Hartford, *C. H. Bissell* in 1906; Wethersfield, *C. Wright*. New York: Cypress Hills, Long Island, *W. C. Ferguson* in 1924.[1] District of Columbia: near Deanwood, *C. F. Wheeler* in 1905; vic. of Washington, *E. S. Steele* in 1897. Virginia: Williamsburg, *E. J. Grimes* 3707. Indiana: Pilot Knob Hill, Crawford Co., *C. C. Deam* 27833. Kentucky: near Mammoth Cave, *H. K. Svenson* 163 (in part). Missouri: Genevieve, *F. P. Metcalf* 762; St. Louis, *Engelmann* in 1845 (type collection); Forest Mill, Jasper Co., *E. J. Palmer* 3770; near Asbury, Jasper Co., *E. J. Palmer* 34663 (in herb. E. J. Palmer). Oklahoma: Shawneetown, McCurtain Co., *H. W. Houghton* 3835.—Of the same general range, but apparently extending farther northward in the Mississippi Valley and southwestward to Arizona is

Forma **detonsa** (Gray), n. comb. Bristles absent or represented only by their short naked bases.—*E. Engelmanni* var. *detonsa* A. Gray in Patterson, Cat. Fl. Illinois, 46 (1876) and Bot. Gaz. iii. 81

[1] Collected by the writer, since this was in type, on serpentine barrens, Nottingham, Pennsylvania.

(1878); Fernald, Proc. Am. Acad. xxxiv. 495 (1899); Robinson & Fernald in Gray Man. ed. 7: 183 (1908).—MASSACHUSETTS: Winter Pond, Winchester, *E. H. Hitchings* in 1878, and many subsequent collections [a monstrous form with compound spikelets, *C. W. Swan* in 1884, *C. W. Jenks* in 1884].[1] PENNSYLVANIA: Conewago, *A. A. Heller* in 1901; damp sandy ground, Tinicum, Delaware Co., *A. H. Smith*. MICHIGAN: Jackson, *S. H. Camp* in 1893; Detroit, *Wm. Boott*. INDIANA: two miles north of Culver, Marshall Co., *C. C. Deam* 45400; Laporte, *E. J. Hill* in 1875. ILLINOIS: Oquawka, *Patterson* (TYPE in Gray Herb.); in a cold bog, Illinois River bottom, Peoria, *F. E. McDonald* in 1904. ARIZONA: Flagstaff, *M. E. Jones* 4058 (P).

I have seen no specimens from Nebraska and Oklahoma, but such are cited from these states by Fernald (l. c.). It has seemed desirable to reduce this to formal rank since it has no distinct geographical range.

Var. ROBUSTA Fernald. Culms stout, about 3 dm. high: the pale, oblong-lanceolate heads becoming 2 cm. long: achenes distinctly larger than in the other forms; the thicker tubercle less flattened.—Proc. Amer. Acad. xxxiv. 496, figs. 41–44 (1899).—MISSOURI: Montier, *B. F. Bush* 585. Fernald (l. c.) cites several additional specimens from Missouri, and also a collection by D. Griffiths from western South Dakota.

Var. **monticola** (Fernald), n. comb. Differs from typical *E. Engelmanni* in the pale-brown, ovate-lanceolate to oblong-lanceolate spikelets, with the less appressed scales often becoming acute.—*E. monticola* Fernald, Proc. Amer. Acad. xxxiv. 496, figs. 45–50 (1899); Piper, Contrib. U. S. Nat. Herb. xi. 160 (1906); Jepson, Fl. Calif. pt. vi. 195, fig. 15 (1922). *E. ovata* var. *Engelmanni* Britton, Journ. N. Y. Micr. Soc. v. 103 (1889) in part. *Trichophyllum monticolum* House, Am. Midl. Nat. vi. 205 (1920). *E. Engelmanni* Britton in Abrams, Ill. Fl. i. 263 (1923) in part, not as to fig. 628. *E. monticola* var. *pallida* St. John, Nw. Sci. ii. 81 (1928).—Idaho to Washington and Arizona. IDAHO: Nampa, Canyon Co., alt. 2000 ft., *Nelson & Macbride* 1061; Falk's Store, Canyon Co., alt. 2200 ft., *J. F. Macbride* 330. ARIZONA: White Mts., *D. Griffith* 5271. CALIFORNIA: Plumas Co., *Mrs. Pulsifer Ames* in 1876 (TYPE in Gray Herbarium); northern Sierra Nevada, *J. G. Lemmon* 485. OREGON: Multnomah Co., *T. J. Howell* 408; Salem, *J. C. Nelson* 1605 (resembling typical *E. Engelmanni* in its dark appressed scales); Sullivan's Gulch, Portland, *E. P. Sheldon* 10882. WASHINGTON: low muddy shores of ponds and river, near Bingen, *W. N. Suksdorf* 2583; Parker, Yakima Co., August 8, 1901, *A. D. Dunn;* Montesano,

[1] In these specimens there seems to have been a proliferous development of scales, with no trace of either pistils or stamens.

June 24, 1892, *L. F. Henderson;* Columbia River, W. Klickitat Co., *W. N. Suksdorf* 89.—The form with bristles lacking or rudimentary may be considered as

Var. **monticola** forma **leviseta** (Fernald), n. comb. *E. monticola* var. *leviseta* Fernald, Proc. Amer. Acad. xxxiv. 496, figs. 51, 52 (1899). —Manitoba to New Mexico and westward. Manitoba: Killarney, *Macoun* 16365. North Dakota: wet fields, Leeds, *J. Lunell* 10. Idaho: valley of Coeur d'Alene River, Kootenai Co., *Sandberg, MacDougall & Heller* 649; northern Idaho, *Sandberg* in 1892. New Mexico: Mogollon Mts., Socorro Co., alt. 8000 ft., *C. B. Metcalf* 589. California: Yosemite Valley, *Bolander* 6230, *Abrams* 4631; Prattville, alt. 4500 ft., *M. E. Jones* in 1897 (P). Washington: shore of Lake Calispell, *F. O. Kreager* 332a and 332b.

The achene of *E. monticola* is identical with that of *E. Engelmanni* and, since the two are scarcely separable in the upper Mississippi Valley and in the Southwestern States, it seems best to treat the plant of the western United States, with light-brown, ovate-lanceolate spikelets (*E. monticola*) as a variety of *E. Engelmanni.* Indeed the Patterson collection, which is the type of *E. Engelmanni* var. *detonsa,* has scales as light in color as those of *E. monticola,* and the scales are not firmly appressed. In the original description of *E. monticola* the scales were said to be darker than those of *E. Engelmanni,* but in all except one of the specimens cited they are decidedly lighter. The plants with rudimentary bristles fall naturally into the category of "forms," and since they are not geographically segregated this classification seems a proper one.

39. E. diandra C. Wright. Erect or depressed, culms 0.1–5 dm. long: sheaths usually brown at base; the apex firm: spikelet ovoid, 2–7 mm. long, many-flowered: scales membranous, somewhat spreading, ovate to ovate-oblong, obtuse, greenish or pale-brown, with a green midrib: style bifid: stamens 2: achene light-brown, obovoid or inverted-pyriform: tubercle flattened, depressed, ½ to ⅔ as wide as the achene: bristles lacking or rudimentary.—Bull. Torr. Bot. Club x. 101 (1883); Fernald, Proc. Am. Acad. xxxiv. 496, figs. 53–58 (1899); Fernald, Rhodora ii. 60, incl. var. *depressa* Fernald (1900); Robinson & Fernald in Gray, Man. ed. 7: 182, fig. 245 (1908); Long, Bartonia, 1927–1928, 40 (1929). *E. ovata* Britton, Journ. N. Y. Micr. Soc. v. 102 (1889), in part.—Maine to Pennsylvania: sandy shores or estuaries of the Androscoggin, Kennebec, Merrimac, Connecticut, Hudson, and Delaware Rivers, and on Lake Champlain, Vermont, and Oneida Lake, New York. Maine: Topsham, *C. H. Bissell* in 1911 (N. E. B. C.); Bowdoinham, *N. C. Fassett* 117 (N. E. B. C.), *Fernald & Long* 12786; Gardiner, *N. C. Fassett* 1030 (N. E. B. C.); Brunswick, *K. Furbish* in 1912 (N. E. B. C.), *C. A. Davis* in

1894. New Hampshire: Manchester, *F. W. Batchelder* in 1906 and 1908; Walpole, *E. Brainerd* in 1899. Vermont: Westminster, *E. Brainerd* in 1899; Colchester, *E. Brainerd* in 1903. Massachusetts: Northampton, *E. Brainerd* in 1899. Connecticut: Hartford, *C. Wright* in 1880; East Windsor, *C. H. Bissell* in 1899 and 1900; *C. H. Bissell* in Plant. Exs. Gray. 135; Wethersfield, *C. Wright* in 1880 (type in Gray Herbarium); Lyme, *C. B. Graves* in 1900. New York: Lansingburgh (*E. C. Howe*, 41st Rept. N. Y. State Mus. 58 (1888)); Baker's Falls, *S. H. Burnham* (Torreya, xix. 126 (1919)); Hudson, *H. K. Svenson* in 1923; Oneida Lake, *J. V. Haberer* in 1900, *H. D. House* 2807. New Jersey: Delair, Camden Co., *Van Pelt & Long* in 1907 (Bartonia 1927–28, 40 (1929)). Pennsylvania: Tullytown, Bucks Co., *Long* 33492 (Bartonia, l. c.).

E. diandra was first collected by Charles Wright on the Connecticut River between Wethersford and Hartford. It is very close to *E. ovata*, from which it may be an offshoot; and, except for the lack of bristles and the marcescent character of the scales it is at times almost indistinguishable from that species. Its distribution, however, is limited to a few river systems. When diurnally submersed in estuaries the culm is erect, and both culm and scales remain green. In a collection which I made on the Hudson River under such conditions, the culms arose from successive nodes at the base, giving the effect of a rhizome. By the depressed tubercle and two stamens, *E. diandra* can be readily distinguished from the bristleless variety of *E. obtusa* which I am describing on a succeeding page. In *E. diandra*, which has two stamens, the median stamen along the outer face of the achene is missing. Dr. N. C. Fassett discusses this species in his interesting paper on the Vegetation of Estuaries, Proc. Boston Soc. Nat. Hist. xxxix. 73–130 (1928). I have not seen the specimens which I have listed from Lansingburgh and Baker's Falls, New York, nor those from New Jersey and Pennsylvania, but the records are beyond doubt.

40. E. ovata (Roth) R. & S. In habit similar to *E. obtusa*, but usually less coarse: culms 0.3–5 dm. long: spikelet globose-ovoid to ovoid-cylindric, obtuse or acute, many-flowered, 2–8 mm. long: scales oblong to narrowly ovate, obtuse, purplish-brown, with pale midrib and base and a white scarious margin: achene obovoid or inverted-pyriform, light-brown, shining, 1 mm. long, excluding the deltoid-conic style-base, which is half as broad as the summit of the achene: bristles light-brown, 6–7, exceeding the achene.—Syst. ii. 152 (1817); C. B. Clarke, Journ. Bot. xxv. 268 (1887); Terrac. Malpighia, ii. 310 (1888); Fernald, Proc. Am. Acad. xxxiv. 494, figs. 8–10 (1889);

C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. 628 (1893); Hegi, Ill. Fl. Mitteleur. ii. 39, fig. 196 (1909 ?); Rouy, Fl. France, xiii. 363 (1912). *Scirpus ovatus* Roth. Tent. Fl. Germ. ii.[2] 562 (1793) and Catal. i. 5 (1797); Aschers. & Graebn. Syn. ii.[2] 292 (1904). *S. capitatus* Schreb. Spic. Fl. Lips. 60 (1771),[1] not L. *S. compressus* Moench. Meth. 349 (1794), not Pers.[2] *S. annuus* Thuill. Fl. Paris, ed. 2: 22 (1799). *S. soloniensis* Dubois, Meth. 295 (1803). *S. nutans* Bergeret, Fl. Pyr. i. 43 (1803).[3] *S. turgidus* Pers. Syn. i. 66 (1805). *S. multicaulis* Gmel. Fl. Badens. i. 96 (1805), not Sm. *Bulbostylis ovata* Steven, Mém. Soc. Imp. Nat. Mosc. v. 355 (1813). *Clavula ovata* Dumort. Fl. Belg. 143 (1827). *Eleogenus ovatus* Nees, Linnaea, ix. 294 (1834). *Cyperus ovatus* Missbach & Krause in Sturm, Fl. Deutsch. ed. 2, ii. 25, t. 5, fig. 1 (1900). *Trichophyllum ovatum* Farwell, Rep. Mich. Acad. Sci. xxi. 358 (1920). *Eleocharis annua* House, N. Y. State Mus. Bull. no. 243–244: 58 (1923).[4] Illustrations: T. G. Nees, Gen. Fl. Germ. ii. t. 18, figs. 17–20; Fl. Dan. t. mdccci; Host. Gram. Austr. iii. t. 56; Reichb. Ic. Fl. Germ. viii. t. 295, figs. 700–701; Anderss. Cyp. Scand. t. 2, fig. 25; Fernald, Proc. Am. Acad. xxxiv. 494, figs. 8–10; Hegi, Ill. Fl. Mitteleur. ii. fig. 196; Sturm, Fl. Deutsch. ed. 2, ii. t. 5; Husnot, Cyp. t. 18; Robinson & Fernald in Gray, Man. ed. 7, fig. 246; Syreitschikov, Ill. Fl. Moscow, 170.—In North America locally from Newfoundland and eastern Quebec south to central Maine, Vermont, Connecticut and Massachusetts; also in Michigan, Wisconsin, Minnesota and Washington. Newfoundland: Rushy Pond, Valley of Exploits River, *Fernald & Wiegand* 4696. Quebec: Lac Tremblant, Terrebonne Co., *J. R. Churchill* in 1922; Black Lake, Megantic Co., *Fernald & Jackson* 12030. New Brunswick: Campbellton, *Macoun* in 1882. Maine: Fort Kent, *Fernald* in Pl. Exsicc. Gray. 55[a]; Masardis, *Fernald* 2837, 2834; Van Buren, *Fernald* in Pl. Exs. Gray. 55; Island Falls, *Fernald* 2835; St. Francis, *Fernald* 2836; Blanchard, *Fernald* 2833. Vermont: Spectacle Pond, Wallingford, *Eggleston & Ross* 638, and *Eggleston* in 1900; Abby Pond, Ripton, *Brainerd* in 1889; *Brainerd & Eggleston* 2140; Middlebury, *Brainerd* in 1878. Massachusetts: Dedham, *E. H. Hitchings* in 1878.[5] Connecticut: East Windsor, *C. H. Bissell* in 1903. Michigan: Keweenaw Co., *O. A.*

[1] I have not seen this reference.

[2] This is referred by Moench to Ehrhart, Beiträge v. 155. The correct citation is apparently Ehrhart, Beiträge iv. 155 (1789), but here Ehrhart makes no definite publication, but merely states that *Scirpus capitatus* L. (i. e. the Gronovian plant) differs from *Scirpus capitatus* of Schreber, Krocker and Roth (i. e. *Eleocharis ovata*) in that the latter is characterized by "Culmum compressum . . . . Stamina duo, und einen Stylum bifidum."

[3] Bubani, Fl. Pyr. iv. 204 (1901) refers this to *E. multicaulis*.

[4] House makes this new combination because of prior publication of *Scirpus ovatus* by Gilibert, Exercit, Phytol. (1792), which *Index Kewensis* refers to *E. palustris*. I have not seen the publication by Gilibert.

[5] This fragmentary specimen is apparently the only basis for Massachusetts. It should perhaps be referred to *E. obtusa* var. *jejuna*.

Farwell 547. WISCONSIN: Marinette, *J. H. Schuette* in 1891 and 1892. MINNESOTA: streambed 2 miles east of Fort Ripley, Crow Wing Co., *Rosendahl & Butters* 3605. WASHINGTON: "Oregon," *E. Hall* in 1871 (probably collected in Washington); springs near Vancouver Lake, *Suksdorf* 2328; muddy shores of ponds near Bingen, *Suksdorf* 2582.

The Connecticut record is based upon a single collection by Bissell, from the banks of the Connecticut River at E. Windsor in 1903. The remainder of the material which was cited by Fernald (l. c.) from eastern Massachusetts, under *E. ovata* var. *Heuseri*, is here included under *E. obtusa* var. *jejeuna*.

In Europe (the type locality is Germany) *Eleocharis ovata* is likewise scattered in occurrence. According to Ascherson & Graebner (l. c.), it is rare or scattered through the greater part of central Europe; lacking in the Netherlands, West Prussia and the Tyrol; rare in the northwest German lowlands, Mecklenburg, Pomerania, East Prussia, Switzerland and the coniferous region of the Mediterranean and not ascending more than 500 meters in the mountains. They list it also from France, Northern Italy, south and central Russia, Transcaucasia, Siberia, India, eastern Asia, North America and the Hawaiian Islands.

However, all the Hawaiian material, so far as I have come in contact with it, is *E. obtusa*. The Indian reference is based wholly upon Wallich Cat. 3487 (in part) which C. B. Clarke, Journ. Bot. l. c. queries with "an revera in India lecta." Clarke (l. c.) cites it from Java (*Zollinger*) but Koorders, Excurs, Fl. Java, i. 197 (1911), questions its presence there, and Clarke makes no further reference to it in Hook. f. Fl. Brit. Ind. Ledebour, Fl. Ross. iv. 245 (1852), cites it from central Russia (Lithuania, Kursk); Caucasian provinces (Iberia = Georgia) and Davuria (*Turcz.*). Clarke also cites it from Troy (h. Calcutta.); and by Maximowicz, Fl. Amur. 298 (1859) it is listed from several stations in Amur. *E. ovata*, cited by Hemsley, Biol. Central. Am. Bot. iii. 456 (1885), from southern Mexico, based on *Coulter* 1624, is unquestionably a different plant.

In North America *E. ovata* is rather boreal and apparently confined to calcareous regions, supplanting *E. obtusa* in the calcareous regions of Northern Maine. It has been confused with *E. obtusa*, from which it may be distinguished by the narrower achene, with its slender tubercle one-half as broad as the achene, and by the softer texture of the scales, which are usually reddish-brown.

Var. Heuseri (Uechtritz) Garcke. Plants dwarf (not exceeding 10 cm. in height), loose or spreading; culms often prostrate or arched: spikelets smaller (2–3 mm. long), deep-brown, almost spherical: scales darker with small membranous margin (= var. *minima* Beck. von Man.).—Garcke, Ill. Fl. Deutsch. Aufl. 17: 625 (1895); Fernald, Proc. Am. Acad. xxiv. 494 (1889);[1] Hegi, Ill. Fl. Mitteleur. ii. 39 (1909 ?). *Scirpus ovatus* var. *Heuseri* Uechtritz, Jahresber. Schles. Ges. Vater. Cult. 1866. *E. ovata* β *minima* Beck von Man. Fl. Nieder-Oestr. i. 126 (1890); Rouy, Fl. France, xiii. 363 (1912).

Terraciano, Malpighia, ii. 310 (1888) divides the species into α. *normalis* and β. *italica;* and under the latter describes forma *sessitensis* and var. *humifusa.*

41. E. obtusa (Willd.) Schultes. Annual, usually erect: culms numerous, 0.3–5 dm. long, yellowish-green, capillary to 1.5 mm. in diameter: sheaths purplish at base, at the apex firm and somewhat oblique: spikelets globose-ovoid to ovoid-cylindric, obtuse, many-flowered, 2–13 mm. long, closely or loosely flowered: scales ovate-oblong to suborbicular, brown, with a narrow scarious margin and usually a greenish midrib: style 3- or 2-cleft: achene 1–1.5 mm. long, turbinate-obovoid, narrowed at the base, pale- to deep-brown, smooth and shining: style-base strongly flattened, deltoid, acute, nearly as wide as the achene: bristles 6 or 7, dark brown, coarse, exceeding the achene, retrorsely toothed.—Mant. ii. 89 (1824); Torr. Ann. Lyc. Nat. Hist. N. Y. iii. 302 (1836) excl. Syn. Gron. Fl. Virg.; Fernald, Proc. Am. Acad. xxxiv. 492, figs. 1–7 (1899); Robinson & Fernald in Gray, Man. ed. 7: 182, fig. 247 (1908); Britton & Brown, Ill. Fl. ed. 2, i. 313, fig. 766 (1913). *E. ovata* C. B. Clarke, Jour. Bot. xxv. 268 (1887) and many earlier authors, in part; Britton, Journ. N. Y. Micr. Soc. v. 102 (1889). *Scirpus obtusus* Willd. Enum. Hort. Berol. i. 76 (1809). *S. capitatus* Walt. Fl. Car. 70 (1788); Pursh, Fl. Am. Sept. i. 55 (1814); Elliott, Sk. i. 77 (1816) ?; and many other authors, not L. *S. ovatus* Pursh, Fl. Am. Sept. i. 54 (1814), not Roth. *S. elegantulus* Steud. Cyp. 317 (1855). *E. ovata* var. *obtusa* Kükenth. in Skottsberg, Medd. Göteborgs Bot. Trädgård, ii. 212 (1925–1926).

The type locality of *Eleocharis obtusa* is Pennsylvania. Abundant in muddy or wet places in eastern North America from Cape Breton and eastern New Brunswick (although lacking in the calcareous areas of northern Maine) westward to Nebraska and southward to the Gulf of Mexico, the species appears again in the Northwest, from California to British Columbia; also in the Hawaiian Islands. The

[1] Prof. Fernald informs me that he now considers the American plants which he has so named merely trivial forms, which probably do not represent var. *Heuseri* of Europe.

citation from Australia by Mueller is to be referred to *E. cylindrostachys* Benth. & Mueller, Fl. Austr. vii. 294 (1878).

From a very abundant representation the following are cited as typical. QUEBEC: Lac William, Megantic Co., *Victorin* 11296 (bristles rudimentary); Massauwippi R., Sherbrooke Co., *C. H. Knowlton* in 1923; Dudswell, Wolfe Co., *C. H. Knowlton* in 1923; Longueuil, *Victorin* 1036; North Wakefield, *Macoun* in 1893. PRINCE EDWARD ISLAND: Tignish, *Fernald, Long & St. John* 6951. NEW BRUNSWICK: Bathurst, *S. F. Blake* 5468. NOVA SCOTIA: Sydney, Cape Breton Island, *Fernald* in 1902; and many collections thence south to SOUTH CAROLINA: Charleston, *B. L. Robinson* 257. GEORGIA: Augusta, *J. Metcalf* 104; Stone Mt., *Munz* 1339 (P); Athens, *R. M. Harper* 11. FLORIDA: *Chapman* (without locality). MISSISSIPPI: Saratoga, *S. M. Tracy* 8662. LOUISIANA: New Orleans, *Drummond* 405 (type of *S. elegantulus*). West to ONTARIO: Ottawa, *Macoun* 86,439. MICHIGAN: Menominee, *Schuette* in 1891. WISCONSIN: St. Croix Co., *T. J. Hale* in 1861. MINNESOTA: St. Paul, *Rosendahl* in 1917. IOWA: Grinnell, *M. E. Jones* in 1877 (P). NEBRASKA: Nemaha, *J. M. Bates* 5298. OKLAHOMA: Tonkawa, Kay Co., *Stevens* 1888. KANSAS: Pottawatomie Co., *J. B. Norton* 545. COLORADO: Platte River, south of Englewood, alt. 5300 ft., *I. W. Clokey* 3297. IDAHO: Coeur d'Alene Riv., Kootenay Co., *Sandberg, MacDougall & Heller* 649 (P). OREGON: Lakeside, Coss Co., *Peck* 9012; Columbia Riv., Hood Co., *Henderson* 966 in 1924; Eagle Creek, Clackamas Co., *Abrams* 8802 (P); Portland, *E. P. Sheldon* 10882 (P); Clackamas, *Elmer* 1610 (P). WASHINGTON: Green Lake, Seattle, *Congdon* in 1903; Waitsburg, *R. M. Horner* 510 in 1897; Manor, Clarke Co., *Piper* 3076; Montesano, Chehalis Co., *Heller* 4073 (G, P); Olympia, *Abrams* 9286 (P). BRITISH COLUMBIA: Chilliwack Valley, *Macoun* 34772. HAWAIIAN ISLANDS: Kauai, *A. A. Heller* 2488; Oatui, *Remy* 128; *Seemann* 1708; *Mann & Brigham* 27.

Var. JEJUNA Fernald. Culms capillary, suberect or generally decumbent or spreading, 1 (rarely 2) dm. or less high: heads smaller, fewer-flowered, 2–5 mm. long: scales more spreading, membranous, often tinged with purple: achene somewhat smaller, obovate, with the tubercle about three-sevenths its height.—Proc. Am. Acad. xxxiv. 492, figs. 13, 14 (1899). *E. ovata* var. *Heuseri* Fernald (l. c.) in part.—The following specimens may be included under this variety; although there is a considerable amount of variation and transition to the typical form. NOVA SCOTIA: peaty and muddy dried-out pond-hole, Springhaven, Yarmouth Co., *Fernald & Linder* 20131. MAINE: Milo Junction, *Fernald* 2838; North Berwick, *Fernald* in 1897 (TYPE in Gray Herb.). NEW HAMPSHIRE: Hampton, *E. F. Williams* in 1901; Lebanon, *G. G. Kennedy* in 1890. VERMONT: Westminster, *Brainerd* in 1899. MASSACHUSETTS: in black mud near Winter Pond, *G. G. Kennedy* 9; muddy margin of pond, Purga-

tory Swamp, Norwood, *Fernald, Floyd & Robinson* in Plant. Exsicc. Gray, 138 "spikes more elongated and tubercle narrower than in the extreme form of the species" (transition to typical *E. obtusa*); bog, south of Annursnack Hill, Concord, *E. F. Williams* in 1897; White Pond, Maynard, *C. A. Weatherby* 2843. Rhode Island: Clay Head, Block Island, *Fernald, Long & Torrey* 8882. Connecticut: East Windsor, *C. H. Bissell* 888; Griswold, *C. B. Graves* 281.

This variety seems to be an ecological phase which occurs when the plant is growing in muddy inundated places, and, except for the accompanying change in the character of the achene, I should have been inclined to omit it from consideration. The extreme is reached in a plant collected by Prof. Fernald and myself in a dried out mill-pond at Weymouth, Massachusetts, Oct. 9, 1928 (to be issued in *Plantae Exsiccatae Grayanae*). The erect capillary culms of the Weymouth plant are 4–10 cm. high and form a turf covering the entire muddy bottom; the elliptic to ovate spikelets are 2–3 mm. long, 6–10-flowered; the appressed-ascending scales are rather membranous, green, with dusky-purple sides and scarious margins; the obovate achenes are only 1 mm. long, pale green to light brown, strongly biconvex (approaching orbicular in cross-section), with a greenish acute tubercle as wide as the achene and nearly half as high. On a second visit to this locality the mill-pond was found to be filled with water; and it appears that there is a weekly fluctuation of the exsiccated and submerged conditions. Although at first sight appearing like a distinct species, the Weymouth plant is approached by some other collections from eastern Massachusetts, notably *C. A. Weatherby* 2843 and *E. F. Williams*, Annursnack Hill, Concord. Some of the specimens cited from northern New England closely approach *E. ovata*.

Var. gigantea (Clarke) Fernald. Culms stout and tall, 5–8 dm. high: spikelets ovate-oblong, 9 or 10 mm. long, 5 mm. broad: scales ovate, dark-brown; achenes as large as in the species; the broad obcordate tubercle not depressed, about five-eighths as high as the achene.—Proc. Am. Acad. xxxiv. 493, figs. 11, 12 (1899). *E. ovata* var. *gigantea* C. B. Clarke in Britton, Journ. N. Y. Micr. Soc. v. 103 (1889) *nomen nudum; E. obtusa* Watson, Bot. Calif. ii. 222 (1880) in part, not Schultes.—Washington: Cascade Mts., "Oregon," 49° N. Lat. *Lyell* in 1859. British Columbia: New Westminster, *Macoun* 7557.

This variety was founded by C. B. Clarke on a very large specimen of *E. obtusa* (*Lyell*, Cascade Mts.), the culms of which are over 7 dm.

long. This is approximately twice the size of any other specimen that I have seen from the Pacific Coast. *Macoun* 7557 (of which only the upper portions of a few culms are represented in the Gray Herbarium) has heads as large and culms as stout as in the Lyell plant, and may approach it in size. There is a tendency in *E. obtusa* from the Pacific States to have somewhat larger, darker spikelets than material from the East and the tubercles tend to be larger and higher than in the eastern plant, thus approaching var. *gigantea*. This is true for practically all the specimens from the Pacific States; but, on the other hand, there are all sorts of gradations to the typical form, and scattered throughout the eastern and central states we may find plants with spikelets equally as large as those of the Pacific States. In a widespread annual species, such as *E. obtusa*, many local tendencies to slight variation occur, and the writer does not feel that all of these numerous and complex variations can be definitely set apart.

Var. **Peasei**, n. var., setis nullis.—This variety occurs on the sandy shores of ponds in New Hampshire, Maine, and in Quebec, and has previously been identified either as *E. Engelmanni* or as *E. diandra*. Three stamens are always present, and the tubercle is of the typical form found in *E. obtusa*. NEW HAMPSHIRE: wet sandy shore, Ossipee Lake, Ossipee, Aug. 23, 1923, *A. S. Pease* 19233. (This may be considered as the TYPE in Gray Herb.), 19236 (N. E. B. C.) and Aug. 10, 1921, 18107 (N. E. B. C.). MAINE: damp sandy beach, Lovewell Pond, Fryeburg, Aug. 17, 1927, *A. S. Pease* 17901 (N. E. B. C.). QUEBEC: Ste. Anne de Beaupré, *Macoun* 69304.

Some of these plants show the remarkable phenomenon of developing leafy appendages from the apices of the upper sheaths. These are best developed in the plants with capillary culms, and reach their finest development in *Macoun* 69304, where many of the sheaths have foliar extensions 1 cm. in length. These seem to be in the nature of true leaves, flattened for a short distance from the culm, and then becoming cylindrical by inrolling. Absence of leaves is one of the generic characters of *Eleocharis*, and it is the more remarkable to find such a condition, supposedly atavistic, occurring toward the northern outpost of an annual species, in which, moreover, the perianth is deficient. However, in plants collected by Ezra Brainerd, in a "dried-up swale at Knights Island, Vermont," we have the same capillary aspect of the culms and, to a lesser extent, the presence of foliaceous sheaths, but the achenes are, as in typical *E. obtusa*,

equipped with bristles exceeding the achenes. What I have considered as the type of *E. obtusa* var. *Peasei* (*Pease* 19233) has thickened culms like typical *E. obtusa* and the sheaths merely end in a mucro less than a millimeter in length. However, there are gradations to plants with capillary culms (*Pease* 17901 and 19236) which show well developed foliaceous sheaths.

Var. **ellipsoidalis** Fernald, n. var. in herb., culmis saepe inaequalibus; spiculis ellipsoidalibus; squamis valde adpressis.—Eastern Massachusetts to Virginia, on the coastal plain. Massachusetts: Great Pond, Weymouth, *G. G. Kennedy* in 1908; Hawk's Nest Pond, Harwich, *Fernald* 16306 and 16307; Great Sandy Pond, Pembroke, *St. John & Hunnewell* in 1916 (N. E. B. C.); Shallow Pond, Falmouth, *Fernald & Long* 18021 (type in Gray Herb.); Crooked Pond, Falmouth, *Fernald & Long* 18020; Sparrow Young's Pond, Chatham, *Fernald* 16308; Cole's Pond, East Dennis, *Fernald & Long* 18018; Upper Simmons Pond, Dennis, *Fernald & Long* 16309; Cliff Pond, Brewster, *Fernald & Long* 16310; Buck Pond, Harwich, *Fernald & Long* 16311; Half-way Pond, Barnstable, *Fernald & Long* 16312; No-Bottom Pond, Brewster, *Fernald & Long* 16313; Griffith's Pond, Brewster, *Fernald* 16314. Rhode Island: Beach Pond, Exeter, *Collins & Fernald* 11297; Long Pond, South Kingston, *Collins & Fernald* 11298; Little Sandy Pond, Warwick, *Collins, Fernald & York* 11299. New Jersey: Quaker Bridge, *C. F. Austin* in 1845; Winslow Junction, *Gershoy* 141[a]. Delaware: Greenbank, *Commons* in 1881; Centreville, *Commons* in 1864. Virginia: East Williamsburg, *E. J. Grimes* 3709.

This variety has been noted by Prof. Fernald for many years, and is found in quagmires at the borders of ponds on the coastal plain. It is recognized by the ellipsoid spikelet, ascending lower bracts and closely appressed scales, and somewhat sprawling habit.

Several other variations have come to hand in this complex species. Among them is a plant resembling *E. obtusa* var. *jejuna* in habit but with straw-colored scales, *C. C. Deam* 45541, Bloomington, Indiana. The bristles are rather weak, usually only 4 or 5. Material collected by *D. Pretz*, Bristol, Bucks Co., Pennsylvania in 1886, has loose spikelets and the achenes have 2–4 bristles. Specimens collected by *Holm*, Bunker Hill Road, D. C., September 1, 1915, have capillary culms and loose-flowered spikelets.

Geographical Distribution of Series Ovatae

A small series of five annual species, chiefly in North America. *E. ovata*, of scattered distribution from the Amur westward into

Europe but lacking in large areas, appears very locally in calcareous regions of North America from Newfoundland westward to Oregon and Washington. *E. obtusa*, a ubiquitous species of muddy places in the eastern United States, except in the sandy coastal region of the Southeast, extends westward to the Great Plains, and reappears in the Pacific region from northern California to British Columbia and in the Hawaiian Islands. *E. Engelmanni*, having in general a similar range, but tending to be somewhat more southern, and lacking in the Hawaiian Islands, appears here and there, chiefly in clay deposits. *E. diandra* and *E. lanceolata* are localized; the former on the sandy or muddy shores of a few rivers in northeastern United States; the latter confined to a small area in Texas and Arkansas. This northern series seems most closely related to series *Maculosae*, subseries *Rigidae*, comprising the often tropical *E. caribaea* and *E. atropurpurea*, from which it consistently differs in the color of the achenes and the character of the style-base.

(*To be continued*)

MONOGRAPHIC STUDIES IN THE GENUS ELEOCHARIS

H. K. SVENSON

(*continued from page 219*)

Series MACULOSAE

(Plate 191)

a. Sheaths firm at the apex; achenes black or purplish-brown. Sub-series: RIGIDAE....*b*.

b. Achenes 0.7–1 mm. long ....*c*.

c. Achenes 1 mm. long; spikelets many-flowered, globose to ovoid; scales usually firm; culms 0.3–4 dm. high (widespread in warm or tropical regions).....42. *E. caribaea*.

c Achenes 0.7 mm. long; tubercle depressed, ½ as broad as the achene; spikelets ovoid, 10–20-flowered; scales thin; plants dwarf, 4–10 cm. high (Texas).....46. *E. microformis*.

b. Achenes 0.5 mm. long....*d*.

d. Spikelets elongated, 2–8 mm. long, many-flowered; bristles translucent, much shorter than the achene; achene broadest at summit.....43. *E. atropurpurea*.

d. Spikelets not elongated; bristles opaque; achenes broadest below the summit....*e*.

e. Spikelets 2–3 mm. long, 5–15-flowered; culms 4–12 cm. long; bristles dull-brown to white, obscurely toothed; tubercle less than ⅓ as broad as the achene (Fla., W. Ind.) 44. *E. praticola*.

e. Spikelets 1–2 mm. long, 3–9-flowered; culms 2–5 cm. long; bristles white, retrorsely toothed; tubercle ⅔ the width of the achene (Bahama Ids.).....45. *E. bahamensis*.

a. Sheaths membranous at the apex. Sub-series: OCREATAE....*f*.

f. Mature achene olivaceous....*g*.

g. Spikelets much thicker than the culms; bristles longer than to slightly shorter than achene....*h*.

h. Tubercle elongated; surface of achene smooth or punctulate; culms 2–15 cm. long (rarely longer) (E. U. S. and Can.) 47. *E. olivacea*.

h. Tubercle not elongated....*i*.

i. Culms 12–26 cm. long; scales linear; surface of achene obscurely striate (Galapagos Ids.).....48. *E. galapagensis*.

i. Culms 3–5 cm. long; scales broadly ovate; surface of achene with elongate black striations (Mex.).49. *E. Schaffneri*.

g. Spikelets of same diameter as the thickened culm; bristles glistening-white, shorter than achene (Brazil and Paraguay) 50. *E. Sellowiana*.

f. Mature achenes black or deep-brown....*j*.

j. Spikelets 1–3-flowered; culms 1–4 cm. high (Trop. So. Am.) 51. *E. capillacea*.

j. Spikelets many-flowered....*k*.

k. Scales appressed....*l*.

l. Scales yellow or greenish, not prominently keeled; achenes 0.8 mm. long; bristles shining-white, shorter than the achene (Trop. and subtrop. regions).....52. *E. flaccida*.

l. Scales purplish-brown, the lowest prominently keeled; achenes 1.3–1.5 mm. long, including the style-base; bristles reddish-brown, often longer than the achene (W. Ind. and So. Am.).....53. *E. maculosa*.

k. Scales somewhat spreading, strongly keeled.....*m.*
m. Spikelet about 5-flowered (Afr.).....54. *E. intricata.*
m. Spikelet 10–15-flowered (Brazil).....55. *E. debilis.*

Sub-series Rigidae

42. E. caribaea (Rottb.) Blake. Fig. 48. Cespitose: culms firm, 0.3–4 dm. high, striate and sulcate: sheaths prominent, stramineous, usually with a brown base and with firm, oblique, often attenuate apex: spikelets subglobose or ovoid, obtuse, many-flowered: scales ovate-orbicular, almost cartilaginous to membranous, yellow to pale-brown: style bifid: stamens 2 or 3: achene obovoid, 1 mm. long, lustrous-black; the spongy, whitened style-base variable in shape but usually much depressed: bristles 6–8, coarse, brown, exceeding the achene or occasionally lacking.—Rhodora, xx. 24 (1918); Merrill, Enum. Phil. Pl. i. 119 (1922). *Scirpus caribaeus* Rottb. Descr. Pl. Rar. Progr. 24 (1772) and Descr. Ic. Nov. Pl. 46, t. 15, fig. 3 (1773), ed. 2, 46, t. 15, fig. 3 (1786). *Scirpus capitatus* Willd. Sp. Pl. i. 294 (1798) in part; HBK. Nov. Gen. et Sp. i. 225 (1816). *E. capitata* R. Br. Prod. 225 (1810);[1] Torr. Ann. Lyc. N. Y. iii. 305 (1836); Boeckl. Linnaea, xxxvi. 461 (1869–70); Bentham & Mueller, Fl. Austr. vii. 296 (1878); Britton, Journ. N. Y. Micr. Soc. v. 102 (1889); C. B. Clarke in Hook. f. Fl. Br. Ind. vi. 627 (1893), in Durand & Schinz, Consp. Fl. Afr. v. 597 (1895) and in Urban, Symb. Ant. ii. 66 (1900); Britton and Brown, Ill. Fl. ed. 2. i. 313, fig. 764 (1913); Jepson, Fl. Cal. vi. 194 (1922); Barros, Anal. Mus. Nat. Hist. Buenos Aires, xxxiv. 400, fig. 6 (1928). *E. setacea* R. Br. Prod. 225 (1810).[2] *Eleogenus capitatus* Nees in Wight, Contr. Bot. Ind. 112 (1834). *Chlorocharis capitata* Rikli in Pringsh. Jahrb. xxvii. 564 (1895).—In ditches, marshes, and on banks of streams from "Maryland"[3] and South Carolina to Florida, westward to Texas and California, and southward through tropical America to Peru, Paraguay and southern Brazil. Also common in the tropics of the Old World. Specimens examined: South Carolina: Sullivan Island, *Gibbes*. Florida: Crescent Lake, St. Johns Co., *R. M. Harper* 41; Dade Co., *A. A. Eaton* 14; Miami, *Garber* in 1877; Key West; Blodgett. Texas: *Berlandier* 680, 2090; Sabinal, *C. Wright* 1933; Rio Grande, *C. Wright* in 1848; East of Rio Grande, *Rose & Russell* 24359; Sutherland Springs,

[1] To quote from Blake (l.c.) "The name *Eleocharis capitata* (L.) R. Br. . . . . has a somewhat peculiar status. It was based on 'Scirpus capitatus Linn. sp. pl. ed. Willd. 1. p. 294,' but was expressly distinguished from the Gronovian plant, which of course Brown had examined, the type of *S. capitatus* L. Since, however, Willdenow's *S. capitatus* is based directly on Linnaeus's, the application of Brown's name must be determined by the Clayton plant on which rests the name-bringing synonymy of Linnaeus. The name Eleocharis capitata (L.) R.Br. must therefore now be restricted to the plant which has long been called *Eleocharis tenuis* (Willd.) Schultes."

[2] Benth. & Mueller (l.c.) reduce this to synonymy under *E. capitata* (i. e. *E. caribaea*).

[3] In Gray's Man. ed. 7 and Britton and Brown, Ill. Fl. ed. 2, the range is given from Maryland to Florida, etc. but there are no specimens from north of South Carolina in the Gray Herbarium nor at the New York Botanical Garden.

Wilson Co., *Palmer* 1328; Liberty Co., *C. Wright;* Western Texas to El Paso, *C. Wright* 711; Rio Coleto, *G. Thurber* in 1850. CALIFORNIA: San Bernardino, *S. B. & W. F. Parish* 1160, *S. B. Parish* 5277; Palm Canyon, Riverside Co., *I. M. Johnston* in 1917 and *F. W. Peirson* 5408. BERMUDA: Paget Marsh, *Britton & Brown* 215; Shelly Bay, *Harshberger* in 1905; *D. W. Fellows* 123; Pembroke Marshes, *A. H. Moore* 3164. BAHAMA ISLANDS: Andros, *A. E. Wight* 267; New Providence, *Britton & Brace* 501; Nassau, *Curtiss* 163. CUBA: *C. Wright* 712; Santa Clara, *Britton, Britton & Cowell* 10212; Isle of Pines, *Britton, Britton & Wilson* 14961, 14622; Santa Clara, *Ekman* 17128; Oriente, *Ekman* 6180; Havana, *Ekman* 897; Santa Clara, dist. Cienfuegos, *Combs* 626. PORTO RICO: *Sintenis* 1219, 5617; *A. A. Heller* 6412; San Juan, *Hioram* in 1913. VIRGIN ISLANDS: Purcells, *W. C. Fishlock* 312. JAMAICA: St. Thomas, *Harris* 12283; vic. of Windsor, *Maxon & Killip* 266. HAITI: Etang Saumatre, *E. C. Leonard* 3478, 3525; St. Michel de l'Atalaye, *E. C. Leonard* 7033; vic. of Petionville, *E. C. Leonard* 5087. GUADELOUPE: *Père Duss* 3910, 3126. TRINIDAD: *Britton, Hazen & Mendelson* 1654. GRENADA: Carriscon, *Broadway* in 1898. CURAÇAO: *Currie & Haman* 186. ST. THOMAS: *Eggers* 81. ST. JAN: *Eggers* in 1877. MARGARITA: *J. R. Johnston* 204; *Miller & Johnston* 191 (G, P). MEXICO: Antiqua, Vera Cruz, *Purpus* 6249; Monterey, *Arsène* 6223; Victoria, Tamaulipas, *Palmer* 449; Guerrero, *Langlassé* 124; Hacienda de Angostura, *Pringle* 3812; Guaymas, *Palmer* 635 and 635½; Para del Correo, *Liebmann;* Salina Cruz, *C. C. Deam* 105; Izamal, Yucatan, *Gaumer* 424. GUATEMALA: Dept. Baja Verapaz, *Tuerckheim* (S); Gualan, *S. F. Blake* 7675; Lake Izabal, *S. F. Blake* 7832; Laguna de Amatitlan, *Pittier* 117; Gualan, *C. C. Deam* 433. SALVADOR: Mahulingo, *Standley* 22032; San Vincente, *Standley* 21180. VENEZUELA: La Ceiba, *Pittier* 10882. COLOMBIA: Villavicencia, *F. W. Pennell* 1530; Dept. of Santander, *F. W. Pennell* 3845; Santa Marta, *H. H. Smith* 238; vic. of Cucuta, Dept. Santander, *Killip & Smith* 20975. BOLIVIA: Rio Perdix, Prov. Sara, Dept. Santa Cruz, *J. Steinbach* 7454. ECUADOR: Catamayo, *André* 4392. PERU: U. S. Exploring Expedition prope Tarapoto; *Spruce* 4190. FRENCH GUIANA: *Jelski* 1867 (Ph.). BRAZIL: Bahia, *Salzmann* in 1840; Rio de Janeiro, *Glaziou* 1293; Pernambuco, *Gardner* 1203 (G, S.). PARAGUAY: Ipacaray, *Hassler* 12658. AFRICA: Senegal, *Laprieur* in 1827; West. Trop. Africa, *G. Mann* 891 (in part); Socotra, *Balfour* 730. INDIA: Behar, *Hooker;* Bengal, *Wallich* 3486e, *Griffith;* Peninsula Ind. orientalis, *Wight* 1899; Ceylon, *Thwaites* 3039. CHINA: Hong Kong, *C. Wright* 593. PHILIPPINE ISLANDS: Manila, *E. D. Merrill* 55; vic. Manila, *Wilkes Expl. Exped.;* Manila, *R. C. McGregor* in Kneucker, Cyp. et Junc. Exsicc. 227. FIJI ISLANDS: Tahiti, *Leland, Chase & Tilden* 3; dripping rocks, base of maritime cliffs, Tahiti, *Setchell & Parks* 269. AUSTRALIA: Victoria River, *F. Mueller.*

There is some variation in this species. I have seen bristleless

specimens from Bahia (*Salzmann*) and Senegal (*Laprieur*). The style-base in some of the Indian and Chinese material is not depressed and some of the specimens from Tahiti tend to have lax scales. *E. caribaea* is apparently a common tropical species, and seems related to *E. atropurpurea.* Some of the material from eastern Brazil, especially in the region of Rio de Janeiro, is characterized by soft membranous scales. A recent collection from dripping sea cliffs at Avenida Niemeyer, Rio de Janeiro, *L. B. Smith* 1298, has lax roseate scales and at first sight the appearance of a distinct species.

Var. DISPAR (E. J. Hill) Blake. Scales purple-brown: achenes purple-black.—RHODORA xx. 24 (1918). *E. dispar* E. J. Hill, Bot. Gaz. vii. 3 (1882). *E. capitata* var. *dispar* Fernald, RHODORA viii. 129 (1906).—Known only from Lake County, INDIANA: Whiting, *E. J. Hill* in 1881, no. 192 in 1898; Wolf Lake, Whiting, *Agnes Chase* in 1897.

This variety is isolated in the sandy region near Lake Michigan, while the typical form is on the coastal plain. Peattie, RHODORA xxiv. 57–70, 80–88 (1922) has discussed in detail the presence of this and other coastal plain plants in the sand dunes of Lake Michigan.

43. E. ATROPURPUREA (Retz.) Kunth. FIG. 49. Dwarf annual, caespitose: culms 3–12 cm. high, capillary, erect or arcuate: sheaths deep-brown at base; the firm apex oblique and often attenuate: spikelet oblong-ovoid, 2–8 mm. long; the lower scales frequently deciduous: scales ovate, membranous, blunt, with broad green midrib and deep brown sides: style 2-fid: stamens 1–3: achenes strongly flattened, lenticular, obovoid, widest at the summit, 0.5 mm. long, smooth, lustrous-black: style-base minute, flattened, about ¼ the width of the achene: bristles slender, translucent, shorter than the achene, often reduced or wanting.—Kunth. Enum. ii. 151 (1837); J. Gay, Flora, xxv. 641–646 (1842); Boeckl. Linnaea, xxxvi. 458 (1869–1870) excl. vars.; C. B. Clarke, Journ. Bot. xxv. 269 (1887); Terrac., Malpighia, ii. 311 (1888); Britton, Journ. N. Y. Micr. Soc. v. 101 (1889); C. B. Clarke in Hook. f. Fl. Br. Ind. vi. 627 (1893) and in Durand and Schinz. Consp. Fl. Afr. v. 596 (1895); Husnot, Ill. Cyp. 60, t. 17 (1905–1906); Hegi, Ill. Fl. Mitteleur. ii. 39 (1909 ?); Fiori, Nuov. Fl. Anal. Ital. i. 178 (1923). *Scirpus atropurpureus* Retz. Obs. v. 14 (1789); Reichb. Ic. Fl. Germ. viii. 37, t. 295, fig. 699 (1846). *Isolepis atropurpurea* R. & S. Syst. ii. 106 (1817). *Eleogiton atropurpurea* A. Dietr. Sp. Pl. ii. 97 (1833). *Aplostemon atropurpureum* Raf. ex Steud. Nom. Bot. ed. 2: 113 (1840).[1] *Eleogenus*

[1] The genus *Aplostemon* of Rafinesque, Jour. Phys. lxxxix. 105 (1819), contained the species of *Scirpus* with one stamen. Rafinesque included *Scirpus bracteatus* Bigelow (*Scirpus cespitosus* L. var. *callosus* Bigelow), *S. atropurpureus* Retz., *S. polytrichoides* Retz., and a few others, but did not make any actual combinations. With his characteristic logic he states that species of *Scirpus* with two stamens should form

atropurpureus Nees in Wight, Contr. Bot. Ind. 113 (1834). *Scirpus Lereschii* Thomas, Cat. Pl. Suiss. 44 (1837), *nomen nudum;* Reuter, Suppl. Pl. Vasc. Genève, 40 (1841). *Eleocharis Lereschii* Shuttlew. Flora, xx. 241 (1837); Palla in Koch, Syn. ed. 3. iii. 2545 (1905).[1] *Eleogenus laetivirens* Nees in Mart. Fl. Bras. ii.[1] 103 (1842). *Scirpus erraticus* Rota ex De Notaris, Ann. Sci. Nat. sér. 3. v. 366 (1846) and Linnaea, xix. 398 (1847). *Isolepis setifolia* A. Rich. Tent. Fl. Abyss. ii. 498 (1851). *Eleocharis Zanardinii* Parl. Fl. Ital. ii. 67 (1852). *Eleocharis monandra* Hochst. ex Steudel. Syn. Cyp. 75 (1855). *Isolepis allochroa* and *I. dichroa* Steud. Syn. Cyp. 91 (1855), acc. to C. B. Clarke. *Eleocharis erratica* Steud. Syn. Cyp. 79 (1855). *E. laetevirens* Steud. Syn. Cyp. 79 (1855). *E. multiflora* Chapm. Fl. S. States, 517 (1860). *Elaeocharis atropurpurea* Schur, Enum. Pl. Transsilv. 691 (1885); *Trichophyllum atropurpureum* House, Am. Midl. Nat. vi. 204 (1920). Illustrations: Reichb. Ic. Fl. Germ. viii. t. 295, fig. 699; Fiori, Pl. Ital. Ill. fig. 431; Husnot, Cyp. France, t. 17; Robinson and Fernald in Gray, Man. ed. 7, fig. 243; Britton and Brown, Ill. Fl. ed. 2, i. fig. 763; C. B. Clarke, Ill. Cyp. t. 36, figs. 6–9.—Scattered in distribution in the tropics of both the Old and New World; in the United States from Florida and Georgia to Iowa, Nebraska, Colorado, Washington and Texas; also in Italy and Switzerland. The specimens which I have seen are: Georgia: sandy shore of Four Mile Pond, Decatur Co., *R. M. Harper* 1934. Florida: Jackson Co. *Chapman;* Key West, *Riddell* (N. Y.). Texas: bed of Cibolo River, Selma, *H. A. Groth* 132. Colorado: La Poudre River near Greeley, *E. L. Greene.* Nebraska: Exeter, Fillmore Co. *J. H. Wibbe* (N. Y.). Iowa: Muscatine, *Reppert* in 1895. Mexico: Guadalajara, *Pringle* 4002 (in part), *Pringle* 3857 (N. Y.). Colombia: circa de Piedras, *André* no. 1900. India: Plan. Gang. Sup. *Hooker & Thomson;* Bengal, *Griffith.* Africa: Nubia, *Kotschy* 129 (*E. monandra*). Switzerland: Lac Leman, *Leresche* in 1861, *Muret* 13, *Godet* in 1853, *Lerch* in 1872.

This species can be readily identified by the minute glistening-black achenes with translucent setae.

The type locality is India. In Europe *E. atropurpurea* is isolated in northern Italy and about Lac Leman, Switzerland; and in regard to its presence there Palla (Koch. Syn. ed. 3. iii. 2546) writes "This tropical species has without doubt first (and at a comparatively late

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the genus *Diplarinus*, and those with a bifid style another genus, *Dichismus*. (For a discussion of *S. bracteatus* Bigel. see Fernald, Rhodora, xxiii. 24 (1921)). The genus *Megadenus* of Rafinesque, Neogenyton, 4 (1825) differs from *Scirpus* in having two stamens and the achene crowned by a gland. "*Sc. palustris, capitatus, tuberculatus,* etc." No new combinations were actually made.

[1] Palla takes up the name *E. Lereschii*, since, in his estimation *E. atropurpurea* (Retz.) Kunth is a collective species. There is, however, no mistaking *Scirpus atropurpureus* Retz. It is impossible to follow accurately the synonymy of this species as regards the South American material.

time, perhaps by transportation agencies) arrived in Italy and from there made its way into Lake Leman." Merrill has not seen it from the Philippines. Bentham & Mueller cite *E. atropurpurea* from Australia and describe var. *setiformis* which has filiform culms less than 2 inches high; bristles very short or none. Fiori (Nuova Fl. Anal. Ital. l. c.) makes the following division:

A. Persistent base of the style orbicular-depressed. α. TYPICA.
B. Persistent base of the style acute-elongated: spikelet and achene larger than the type. (Endemic in Italy). β. ZANARDINII.

Regarding the number of stamens in this species, Kunth (l. c.) says that the Wallich specimens have three stamens, but *Wallich* 3489[a] has all the flowers with one stamen. Both the African material (*Kotschy* 129) and Texas material have one stamen; occasionally two. The Switzerland material has two stamens, rarely one.

44. E. PRATICOLA Britton. FIG. 46. Culms slender, 4–12 cm. long, tufted, often spreading or recumbent: upper sheaths oblique and firm at the apex: spikelets 5–15-flowered, broadly ovoid, 2–3 mm. long: scales brown, ovate to lanceolate, obtuse, becoming lax in age: achene lenticular, obovoid, about 0.5 mm. long, black, shining; the style-base whitish, apiculate, less than ⅓ as wide as the achene: bristles coarse, white or light-brown, obscurely toothed, shorter than the achene, or often rudimentary.—Britton in Small. Fl. Se. U. S. 182 and 1327 (1903). *Scirpus ocreatus* Griseb. Pl. Cub. 239 (1866). *E. atropurpurea* C. B. Clarke in Urban, Symb. Ant. ii. 65 (1901), in part.—Florida, Cuba, and the Bahama Islands. FLORIDA: low places on prairies, Osceola Co., *A. Fredholm* 5820 (TYPE in herb. New York Bot. Gard.); low pinelands, Fort Meyers, *Jeanette Standley* 29; Dade Co., *A. A. Eaton* 837, in part. CUBA: *C. Wright* 3371 (in part). BAHAMA ISLANDS: Andros, *Small & Carter* 8684.

Since this species has black achenes about 0.5 mm. long it has passed as *E. atropurpurea*, from which it differs markedly in thicker, more spreading culms, few-flowered spikelets, coarse bristles and somewhat larger, slightly roughened achenes. It is more closely related to *E. caribaea* than to *E. atropurpurea*. According to the original description the achenes are dark-brown, but material from the type-collection in the Gray Herbarium has achenes which are black when mature, the immature achenes being dark-brown. The type-collection is evidently rather small material; and the species may be more wide-spread.

45. E. BAHAMENSIS Boeckl. Dwarf and sprawling, matted: culms of unequal length, 2–5 cm. long, capillary-setaceous, erect or recurved, obscurely quadrangular and lightly sulcate: apex of upper

sheath firm, oblique, elongated: spikelet minute, 1–2 mm. long, in fruit broadly ovate, 3–9-flowered: scales membranous, acutish, purplish-brown, with a green midrib: achene minute, about 0.5 mm. long, black and shining, the surface slightly roughened: style-base pallid, disciform, apiculate in the center, about ⅔ the width of the achene: bristles 6, slender, of unequal length, a little shorter than the achene, white, retrorsely toothed, united to form a prominent base.—Cyp. Nov. ii. 11 (1890). *E. atropurpurea* C. B. Clarke in Urban, Symb. Ant. ii. 66 (1900) in part (as to Bahama plant); Britton & Millspaugh, Bahama Fl. 49 (1920); not Kunth. *E. camptotricha* var. *Schweinitzii* C. B. Clarke in Urban, Symb. Ant. ii. 69 (1900).—Endemic in the Bahamas: Andros; Northeastern section, *Small & Carter* 8807; Conch Sound, *J. I. & A. R. Northrop* 745 (distributed as *E. camptotricha* var. *Schweinitzii*);[1] Fresh Creek settlement, *A. E. Wight*, 257 (distributed as *E. camptotricha* var. *Schweinitzii*).

46. E. microformis Buckley. Fig. 45. Culms light-green, cespitose, setaceous, 4–10 cm. long, lightly sulcate, erect or arching: spikelets ovoid, obtuse or acute, 10–20-flowered; scales acute or obtuse, with a green or yellow midrib and light brown hyaline sides, sometimes rufescent: style bifid: stamens 2: achene 0.7 mm. long, broadly obovoid-pyriform, black, shining, the surface minutely pitted: style-base half as broad as the achene, pallid, flattened, apiculate in the middle: bristles 6, light-brown or whitish, coarse, of unequal length, retrorsely scabrous, shorter than the achene.—Proc. Acad. Sci. Phila. (1862) 10 (1863). *E. atropurpurea* Britton, Jour. N. Y. Micr. Soc. v. 101 (1889), in part.—Texas: northern Texas, *Buckley* (type in herb. Philadelphia Acad.); *Reverchon* 14 in 1885; Blanco Co., *Reverchon* 3594; Howard's Creek,)[2] Crockett Co., *C. Wright* 1930; *C. Wright* 1932, 1961; vic. Kerrville, Kerr Co., *A. A. Heller* 1851.

SPECIES DOUBTFUL OR NOT SEEN

E. Ekmanii Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 192 (1926). Fig. 44.—Cuba.

The achene of this species (as represented by *Ekman* 19005 in the

[1] Britton and Millspaugh (l.c.) discuss the incongruity of this name as applied to the Northrop specimens. Clarke's description reads: "stylobasi bulbiformi; spiculis basi interdum proliferis; nuce proventu luteo-brunnea. ***Eleocharis prolifera Torrey! in Ann. Lyceum New York III (1836) p. 316, nec p. 442.*** . . . . Hab in ins **B a h a m a : Northrop n. 524[b]; G u a d e l o u p e : Bertero.**"

E. camptotricha is a member of an entirely different section with triangular achenes. Since *Northrop* 524b is the only tangible reference (and the description of the variety does not seem adequate), the only disposition of the name is as a questionable synonym of *E. bahamensis*.

[2] Although the label reads "C. Wright, Coll. N. Mex. 1851–1852," some of the collection was made in Texas by Wright in 1852, enroute from El Paso to San Antonio, in returning from the expedition,—see Gray, Plantae Wrightianae ii. 6 (1853). "Howards Creek" is written on the label by A. Gray and it is probable that no. 1932 and 1961 were collected in the same general region.

Stockholm Museum) is identical in size, coloration, and bristles with the achene of *E. caribaea*. The style-base is thickened, as is often the case in *E. caribaea*, by white pustule-like enlargements of the exterior cells. The plant, however, is very dwarf, 3–5 cm. high, and with inrolled lanceolate scales. It differs from *E. praticola* in the broad tubercle, and larger achene. Dwarf plants of *E. caribaea* with capillary culms occur, as in the collection by *W. E. Broadway* (Nov. 24, 1898) from Grenada, and *Maxon & Killip* 266 from Jamaica, and there is a tendency in some of these to have soft scales, which tend to become inrolled. Further study of them is needed.

E. SHAFERI Britton, Mem. Torr. Bot. Club, xvi. 59 (1920). Perennial; culms capillary, weak, densely tufted, about 2 dm. long: upper sheath apparently not scarious: spikelet oblong, 4–5 mm. long, 1–1.5 mm. thick, acute, few-flowered: scales pale, appressed, obtuse or obtusish, oblong or oblong-lanceolate; the lower one 2–2.5 mm. long, shorter than the upper ones: bristles 4–6, brownish, about as long as the achene and tubercle: style-branches 2: achene black, lenticular, oblong, 1 mm. long: tubercle sharply conic, ¼ as long as the achene.—Bog-holes in wet thicket, Sierra Nipe near Woodford, Oriente, Cuba (*Shafer* 3414).

E. MADAGASCARIENSIS Chermezon, Bull. Soc. Bot. France, lxxv. 284 (1928).—Madagascar.—It differs from *E. caribaea* in its perennial character, lanceolate spikelet and less densely imbricated scales, larger achene (1 mm. long) and conical style-base.

Sub-series OCREATAE

47. E. OLIVACEA Torr. FIG. 43. Culms light-green, often decumbent, 2–15 cm. long (–3 dm. in elongate plants from the Southern States), flattened and grooved, diffusely tufted from slender rootstocks: apex of upper sheath membranaceous but not conspicuously dilated: spikelets oblong-ovoid, acute, 20–30-flowered, 3–7 mm. long: scales ovate, rather membranous and loosely imbricated, with green keel and brown sides, sometimes green throughout: style bifid: stamens 2 or 3: achene obovoid, narrowed at the base, 1 mm. long, olive to dark-brown; the surface punctulate and often marcescent: the conical style-base light-green, annular-thickened at the base, one-fourth as wide as the achene, sometimes prolonged into a subulate beak: bristles 6–8 (usually 7), green or whitish, opaque or semi-translucent, exceeding the achene, retrorsely toothed.—Ann. Lyc. N. Y. iii. 300 (1836) and Fl. N. Y. ii. 347 (1843); Boeckl., Linnaea, xxxvi. 461 (1869–1870); Britton & Brown, Ill. Fl. i. 250, fig. 581 (1896); Robinson & Fernald in Gray, Man. ed. 7: 182, fig. 242 (1908). *Scirpus olivaceus* Kuntze, Rev. Gen. i. 758 (1891). *Trichophyllum*

olivaceum House, Am. Midl. Nat. vi. 205 (1920).—Quagmires and wet sandy shores; Nova Scotia to Ontario, and southward to Florida, western Pennsylvania, Ohio, and Michigan, chiefly on the coastal plain. The following, selected from a large representation, are characteristic. Nova Scotia: Argyle Head, Yarmouth County, *Fernald & Long* 23368; Wallace Lake, Italy Cross, Lunenberg County, *Fernald & Long* 23367; Tiddville, Digby County, *Fernald & Long* 20128. Maine: tidal mud flats, Bowdoinham, *Fernald & Long* 12783; Somesville, *Fernald* in 1892; Brunswick, *C. A. Davis* in 1894. New Hampshire: Lower Baker Pond, Wentworth, *E. F. Williams* in 1908; Nottingham, *A. A. Eaton.* Vermont: Lake Dunmore, *Brainerd* in 1899; Bristol Pond, *Pringle* in 1879; in mucky border of a pond, alt. 1500 ft., Ripton, *Brainerd* in 1899; Newfane, *A. J. Grout* in 1892. Massachusetts: Long Pond, Saugus, *C. E. Faxon* in 1879; Norwood, *Robinson & Fernald* in Pl. Exsicc. Gray. 134; Plymouth, *E. Tuckerman;* West Tisbury, *F. C. Seymour* 1096, 1601, 1864; Springfield, *C. H. Bissell* 901. Rhode Island: Providence, *S. T. Olney.* Connecticut: Pachaug Pond, Griswold, *C. B. Graves* 278; Lyme, *C. B. Graves* 279, 280; New Haven, *J. A. Allen* in 1878; North Guilford, *G. H. Bartlett* in 1906; Stratford, *E. H. Eames* in 1897. New York: Chase's Pond, Newcomb, *H. D. House* 11386; Slayton Pond, Conquest, *Eames, Randolph & Wiegand* 11411; Mud Pond, Oswego, *Fernald, Wiegand & Eames* 14182; Waterloo, *Metcalf & Wiegand* 5904; Summit Marsh, Spencer, *C. C. Thomas* 1759. New Jersey: Tom's River, *C. F. Parker* in 1867; Winslow Junction, *Gershoy* 140; Point Pleasant, *Gershoy* 145; Manahawkin, *Long* in 1909; Wading River, Catsworth, *Van Pelt* in 1907. Pennsylvania: Presque Isle, *Garber* in 1868; Long Pond, Luzerne County, *A. A. Heller* 698. Maryland: Clinton, *Holm* in 1922. Delaware: St. George, *A. Commons* in 1865. Virginia: Fresh Pond, Princess Anne County, *L. F. & F. R. Randolph* 486. Georgia: *Baldwin* (Ph.). Florida: sandy bed of a shallow stream, Milligan, *A. H. Curtiss* 6914. Ontario: Galt, *Macoun* in 1902; Bay of Quinte, *Macoun* 297. Michigan: Park Lake, near Lansing, *C. F. Wheeler* in 1890. Ohio: Cleveland, *E. Claassen.*

Torrey (l. c. 1836) cites *E. olivacea* from "Pine barrens of New Jersey!; on Long Island near Babylon!; Tewksbury pond, Massachusetts." This member of a partly tropical group makes its way up the Atlantic Coastal Plain, spreading out into muddy shores of ponds in the glaciated area of the northeastern United States and southern Canada. Its occurrence inland is, however, localized. In quagmires bordering the sandy ponds of southeastern Massachusetts it is ubiquitous, and in the same region it reaches a phenomenal development in mud at the upper borders of salt marshes. In specimens from the New Jersey pine barrens and from Delaware, the

scales sometimes take on a coriaceous aspect, as in specimens collected by *Commons* at St. George, Delaware. Some of the southern material has the culms greatly elongated, notably *Gershoy* 145, *Randolph* 486 and *Curtiss* 6914. Clarke, Contr. U. S. Nat. Herb. x. 455 (1908) cites this species from Costa Rica (*Tonduz* 9697), but its presence there seems improbable.

48. E. **galapagensis,** n. sp., rigidula; culmis 12–26 cm. longis, erectis, viridibus, striatis; vaginis 3–5 cm. longis, membranaceis, obscuris, ad apicem marcescentibus, haud inflatis; spiculis 4–6 mm. longis, lanceolatis vel ovatis, ca. 15-floris; squamis linearibus, obtusis, 3 mm. longis, castaneis, dorso viridibus, erosis, ima majore viridi; achaenio obovato, nitente olivaceo, levi obscure striatulo; stylobasi parva, conica, viridi vel brunnea; setis cum achaenio aequilongis, albis.—Galapagos Islands: abundant in marshy ground, 1700 ft. altitude, Wreck Bay, Chatham Island, *A. Stewart* 1079 (type in Gray Herb.).

This species differs from *E. flaccida* (which it resembles in its elongated aspect) in the castaneous spikelets and olivaceous achenes. The achenes resemble those of *E. Sellowiana* in color and striation, but the culms are not inflated.

49. E. Schaffneri Boeckl. Fig. 39. Caespitose; culms light-green, capillary, setaceous, spreading, sulcate, 3–5 cm. high: apex of upper sheath membranous, scarcely inflated, obtuse: spikelet ovate, somewhat acute, 2–3 mm. long, 7–15-flowered: scales membranous, green, sometimes with light-reddish or bronze sides, broadly ovate, obtuse or acute: style bifid: stamens 2 or 3: achene 0.7 mm. long, olive-green; the surface with elongate black striations: style-base very small, flattened, gray, slightly apiculate, one-fourth as wide as the achene: bristles 6 or 7, white, somewhat shorter than the achene.—Boeckl. in Engler, Bot. Jahrb. vii. 274 (1886). *E. exilis* Boeckl. Cyp. Nov. i. 16 (1888).—Mexico.

The type-collection is *Schaffner* 204 from San Luis Potosi. I have not seen this number, but *Schaffner* 575 (in part) from Morales, San Luis Potosi, in the Gray Herbarium, is unquestionably *E. Schaffneri.* On this sheet are three plants, the two smaller conforming exactly to the description. The larger specimen has identical achenes, but is a coarser plant, 12 cm. tall. However, I believe that it is the same, and that subsequent collections may furnish us with intermediate plants. This species is easily recognized by the very small olive-green achenes with depressed tubercles, and by the cespitose habit. *E. exilis* is likewise based on *Schaffner* 204, and the achene is described as light-green and longitudinally striolate.

50. E. Sellowiana Kunth. Fig. 42. Culms numerous, erect, somewhat spongy and thickened, 8–15 cm. long, 1.5–2 mm. wide when dry, striate, constricted below the spikelet: upper sheath with a divided hyaline fugacious apex: spikelet 5–10 mm. long, ellipsoid, acute, many-flowered: scales appressed, oblong, obtuse, scarcely keeled, stramineous, with a narrow brown stripe on each side of the midrib: style 2-fid: stamens 3: achene 0.8–1 mm. long, broadly obovate, turgid-lenticular, somewhat flattened at the margin, olivaceous, shining, minutely black-striate: style-base yellowish-green, short-conic, acute, marginulate below, about one-fourth as wide as the achene: bristles 7 or 8, glistening-white, shorter than the achene.—Enum. ii. 149 (1837); Boeckl. Linnaea, xxxvi. 465 (1869–1870); C. B. Clarke, Pl. Hassler, ii. 238 (1903); Hauman & Vanderveken, Phan. Argent. i. 210 (1917). *Eleogenus Sellovianus* Nees in Mart. Fl. Bras. ii.[1] 103 (1842). *Scirpus Sellowianus* Griseb. Symb. Fl. Argent. 312 (1879).—Brazil and Paraguay.

I have seen no authentic specimen, but *Ostén* 7882 (S) from Villa Eucaruaciou, Paraguay, from which the above description has been drawn, agrees very well with the description by Nees.[1] (Fl. Bras. l. c.; and specimens with more slender culms but identical achenes have been identified as *E. Sellowiana* by C. B. Clarke (S). According to Nees, *Eleogenus Sellovianus* differs from *E. orcreatus* in the thicker culms, somewhat constricted below the spikelet, and in the less plicated character of the sheath-apex. In the Ostén specimen the achenes are finely marked with short black striations.

Var. homonyma (Steud.) Pfeiffer. Spikelets oblong-ovate: scales broadly hyaline at the margin: bristles 3.—Pfeiffer, Herbarium, no. 56: 54 (1921). *Eleocharis homonyma* Steud. Syn. Cyp. 79 (1855), which is based on *Lenormand* 36, Herb. Paris, from Guiana.

I have seen no material.

51. E. capillacea Kunth. Fig. 50. Rootstocks extensively creeping, forming dense mats: culms numerous, capillary, from thickened nodes of the rhizome, 1–4 cm. high, often arched or recurved: upper sheaths reddish-brown or greenish, membranous, slightly inflated at the apex: spikelets 2 mm. long, brown, linear to lanceolate, 1–3-flowered; usually only one achene ripening: scales 2–3, ovate-oblong, acute, reddish-brown, with a hyaline margin: style bifid: stamens 1 or 2: achene obovate, deep purplish-brown to shining-black when mature, 1 mm. long, narrowed at the base: style-base

[1] Some of the descriptions by Kunth, l. c. (1837) were apparently drawn from Nees' material or manuscript (cf. *E. albibracteata*).

depressed, greenish, one-half as wide as the achene, with a free thin margin below, extended upward into a narrow acute beak: bristles usually 7, brown, conspicuously toothed, somewhat exceeding the achene.—Enum. ii. 139 (1837); Boeckl. Linnaea, xxxvi. 434 (1869–1870); C. B. Clarke in Pl. Hassler. ii. 235 (1903); Palla in Wettstein, Bot. Exped. Südbras. i. 172 (1908); not *Scirpus capillaceus* Griseb. Cat. Fl. Cubens. 239 (1866) nor *Eleocharis capillacea* (as to West Indian plants) of C. B. Clarke in Urb. Symb. Ant. ii. 65 (1900), nor Kukenthal in Fedde, Rep. Spec. Nov. xxiii. 191 (1926). *Chaetocyperus capillaceus* Nees in Mart., Fl. Bras. ii.[1] 93 (1842).—Widely distributed in tropical South America. I have seen the following specimens. BRAZIL: *Sellow;* Agoa Clara, *Glaziou* 22328; opp. Curityba in campo humido, Parana, *Dusén* 117a (G, S); Ponta Grossa, Santa Cruz, *Dusén* 2707 (S); Santa Rita do Passo Quetro, S. Paulo, *Hemmendorf* 61 (S); in ripa arenosa rivi Cuyaba Mirim, Sao José, Matto Grosso, *Lindman* A2665 (S); Diamantino, Matto Grosso, *Lindman* A3515 (S); Prov. Magy-mirim, S. Paulo, *Mosén* 1751 (S); in ripa rivuli argillosa reptans, Sao João d'el Rei, Minas Geraes, *Lindman* A179 (S); Caldas, Minas Geraes, *Lindberg* 587 (S), 583 (S); Goyas, *Glaziou* 22328 (S). PARAGUAY: in viciniis Caaguazú, *Hassler* 9431.

The West Indian material is referred to *E. alveolata*, described on p. 241.

52. E. FLACCIDA (Reichb.) Urban. FIG. 47. Culms slender, light-green 0.5–4 dm. long, usually soft and lax, striate, in small specimens sometimes becoming somewhat rigid: apex of sheath membranous, white, inflated: spikelets 2–6 mm. long, ovate, acute or blunt: scales elliptic to oblong-lanceolate, membranous, pale-green or nearly white: style bifid: stamens 3: mature achene lustrous, purplish-brown, 0.8 mm. long, obovate, the surface minutely punctulate: style-base green, conic, acute; bristles 6 or 7 (rarely none), shining-white, shorter than the achene, retrorsely toothed.—Symb. Ant. ii. 165 (1900); Britton & Millspaugh, Bahama Fl. 48 (1920); Britton & Wilson, Bot. Porto Rico & Virgin Isl. 90 (1923). *Scirpus flaccidus* Reichb. ex Spreng. f. Tent. Suppl. Syst. 3 (1828). ? *S. flavescens* Poir. in Lam. Encyc. vi. 756 (1804). *E. capitata* Kunth, Enum. ii. 150 (1837), in part. *Eleogenus ocreatus* Nees in Mart. Fl. Bras. ii.[1] 102 (1842) in part, especially var. *flaccidus*. *Eleoch. ochreata* (Nees) Steud. Syn. Cyp. 79 (1855); Britton & Brown, Ill. Fl. i. 249, fig. 580 (1896); C. B. Clarke in Urb. Symb. Ant. ii. 63 (1900); Lindman, Regn. Cyp. 14, t. 2, fig. 1 (1900); Robinson & Fernald in Gray, Man. ed. 7: 181, fig. 241 (1908). *E. binocrenata* Nees ex Steud., Syn. Cyp. 79 (1855). *S. ocreatus* Griseb., Fl. Br. W. Ind. 570 (1864). *E. albivaginata* Boeckl. Vidensk. Med. Kjob. 1869: 133 (1870) and Linnaea, xxxvi. 436 (1869–1870) in part, especially var. *flaccida;* *S. anisochaetus* C. Wright in Sauv. Fl. Cub. 174 (1871). *E. thermalis*

Rydb. Mem. N. Y. Bot. Gard. i. 69 (1900). *E. flavescens* (Poir.) Urban, Symb. Ant. iv. 116 (1903). *Trichophyllum ochreatum* and *T. thermale* House, Am. Midl. Nat. vi. 205 (1920).—Southern New Jersey (acc. to W. Stone, Pl. So. N. J. 259 (1910)), ? South Carolina and Georgia to Mississippi, and in hot springs at Yellowstone Park; southward into tropical America. I have seen the following specimens: South Carolina: *Ravenel* (perhaps not from South Carolina). Georgia: Alexander, Burke County, *J. B. Ellis* in 1860; Bulloch County, *R. M. Harper* 952. Florida: shore of St. John River, Jacksonville, *Curtiss* 3076; miry places near Jacksonville, *Curtiss* 5065; moist sandy ground near Jacksonville, *Curtiss* 5694; Indian River, *Curtiss* 5806; Eustis, Lake County, *Nash* 2077; Apalachicola, *Chapman* 3880. Mississippi: Biloxi, *Ball & Tracy* in 1903. Wyoming: Sylvan Geysers, Yellowstone Park, *A. Nelson* 6157 (P, G); Lower Geyser Basin, Yellowstone Park, *Rydberg & Bessey* 3812. A specimen in the Pomona College herbarium collected by *Burton*, at St. Thomas, California in 1882 may belong to this species. Cuba: *C. Wright* 711 (in part, mixed with *E. praticola*); *C. Wright* 3761 (*S. anisochaetus*); La Perla, Oriente, *J. A. Shafer* 8570. Porto Rico: near Anasco, *A. A. Heller* 4532; *Sintenis* 176, 4180, *Eggers* 1330 (U. S.) Jamaica: Peckham, Upper Clarendon, *Harris* 12809; near Albion, St. Thomas, *Harris* 12169. Martinique: *Hahn* 703. Costa Rica: San Ramon, *Brenes* 14439. British Guiana: *Jenman* 6117 (U. S.); *Hitchcock* 17026. French Guiana: vic. Cayenne, *Broadway* 940 (U. S.). Venezuela: near Caracas, *Pittier* 9638, 9636; Colonia Tovar, Aragua, *Pittier* 9959. Brazil: Rio de Janeiro, *Wilkes Exped.*, 1838–1842. Paraguay: *Hassler* 5563 (very young). Reported by C. B. Clarke from many localities in the Old World. *Burchell* 1171 and 1600 from Brazil with very turgid achenes are perhaps to be included in this species.

In the southern United States, specimens of *E. flaccida* have often been confused with *E. olivacea*. Although several reports exist of its occurrence in Delaware, Virginia, and New Jersey, I have seen no undoubted specimens from north of Georgia.

The name *E. flaccida* seems to be strictly applicable only to the tall lax plant described by Sprengel as similar in appearance to *Scirpus simplex* Elliott, and coming from Dutch Guiana. This tall, lax plant I have seen from southern United States only in two collections, *Chapman* 3880 and *Harper* 952, but it apparently descends gradually into the dwarf, sometimes even rigid plant which has been included in *E. flaccida* by both Urban and Britton and which is treated by C. B. Clarke under typical *E. ochreata* Nees. *E. flavescens* seems to be involved, but I do not think its status can be determined until the actual Poiret specimens are examined. *Scirpus flavescens*

Poiret was described from a collection by *Ledru*, and characterized by greenish-yellow culms, "3 poll." [app. 7 cm.] high, enveloped at the base by a membranous sheath prolonged to an almost subulate point. The green spikelet, 1–3-flowered, was furnished at the base with two opposite, obtuse, concave scales a little shorter than the flowers. The achene is not described.

The name *Eleocharis ocreatus* has a peculiar status. The first adequate publication of the specific name is by Neeis n Martius, Fl. Bras. (l. c.) as *Eleogenus ocreatus*, referring to *Eleocharis ochreata*, Linnaea, ix. 294 (1834) (a *nomen nudum*) as a "lapsu calami." The specific name refers to the peculiar character of the sheath-apices, comparable to the *ocreae* in the *Polygonaceae*. So complicated is the synonymy that it seems best to include here a brief tabular resumé (in English) of Nees' polymorphic *Eleogenus ocreatus* (l. c.) in order to obtain a clear interpretation of species which may be involved:

α. Spikelets obtuse at both ends.
  a. 1 *minor*. Membranaceous sheaths conspicuous, often duplicate. *Gardner* 150.
  a. 2 *flaccidus*. Membranous sheaths not distinct; culms taller ("pedalibus"). *E. sulciculmis* Reichb. in Sieb. herb Trinit. n. 4. *Scirpus flaccidus* Reichb. in Weigelt herb. Surinam.
β. Spikelets acute at apex and base ("acutiuscula").
  b. 1 *pallida*. Spikelet pale green. Brasil. orient. *Chamisso & Sello.*
  b. 2 *albo-ater*. Scales fuscous, margins white. *S. albo-ater* Schrader in Sched. Sao Paulo.
  b. 3 *binocreatus*. Scales as in preceding; sheath-apex inflated, rugose. *Macrae:* Ins. St. Catharine. *E. maculosa* forma *humilis* Kunth, En. ii. 147. [No definite publication by Kunth and no citation of specimen]. *E. arcuata* Kunze in Poepp. Coll. Chil. n. 11.

For apparently no good reason, Boeckeler replaced *Eleogenus ocreatus* by the equally polymorphic *Eleocharis albivaginata* and under the latter treated five varieties: α. *tenuis* (Brazil, *Sello*); β. *flaccida* (*S. flaccidus* Reichb.); γ. *stricta* (*E. sulciculmis* Reichb. and *S. Gaudichaudianus* Kunth); δ. *macrostachya* (Brazil, Montevideo (*Sello*), Porto Rico); and ε. *humilis* (*S. flavescens* Poir. in hb. Willd. no. 1162, and *S. repens* Willd. no. 1175). Var. *humilis* was cited by Boeckeler from Carolina (*Beyrich*), Brazil (*Chamisso, Sello*) and Mauritius (*Du Petit-Thours*). *Scirpus flavescens* of the Willdenow herbarium is not necessarily identical with the Poiret specimen, but according to Urban, Symb. Ant. iv. 116 (1903) "ex hb. Desfont., verisimiliter a Ledru lect." *S. flavescens* was collected by Ledru in Porto Rico. C. B. Clarke in Durand & Schinz, Consp. Fl. Afr. v. 599 (1895) and in Urban, Symb. Ant. ii. 63 (1900) revived the name *Eleocharis ochreata*, still treating

it as covering a polymorphic species, but recognizing only two varieties besides the typical plant: β. *flaccida*, the elongated plant (3–5 dm. long) and γ. *humilis* (Boeckl.), the latter being the dwarf rigid plant, its range extended by Clarke to tropical Africa, Socotra, Madagascar, the Mascarenes and Australia. Finally Urban, Symb. Ant. ii. 165 (1900), made the combination *Eleocharis flaccida*, thus retaining the earliest specific name, but still equivalent, according to Urban, to "*Eleocharis ochreata Nees (1834) cum var. flaccida et humilis.*" It is to be hoped that an examination of the plants representing the synonyms included by Nees under *Eleogenus ocreata*, in correlation with the more recent collections from South America, will clear up the difficulties of nomenclature of the American plants.

I have seen no material from the Old World, included under *E. ochreata* var. *humilis* by C. B. Clarke. Chermezon, Bull. Soc. Bot. France, lxxv. 285 (1928) considers the Madagascar plant as *E. minuta* Boeckl. in Engler, Bot. Jahrb. v. 503 (1884). The type, *Hildebrandt* 3527, is a dwarf plant 1–2 cm. high, with sulcate quadrangular culms. Merrill, Enum. Phil. Plants, i. 120 (1922) states that he has seen no specimens of *E. ochreata* from the Philippines, although C. B. Clarke, Phil. Journ. Sci. Bot. ii. 90 (1907) assigns *Loher* 742 to that species.

Var. FUSCESCENS Kükenthal in Fedde, Rep. Spec. Nov. xxiii. 191 (1926).—Culms strict, 5–10 cm. high: scales fuscescent on the sides, the margins broadly whitish-hyaline.—Kükenthal cites two specimens from CUBA: *Ekman* 18763 from Pinar del Rio and *Ekman* 18369b from Prov. Santa Clara. I have not seen these specimens but *A. A. Eaton* 837 (in part) from Dade County, FLORIDA, in the Gray Herbarium, probably belongs to this variety, although the culms are only 3–5 cm. high.

53. E. MACULOSA (Vahl) R. & S. FIG. 40. Stolons elongate, castaneous: culms 7–35 cm. long, erect, striate, rigid: apex of upper sheath conspicuously enlarged, scarious, and rugose: spikelet 5–12 mm. long, ovoid to lanceolate, many-flowered, the scales densely imbricated: scales ovate, rather blunt, firm, shining, purplish-brown, with scarious margins; the lowest orbicular, with a prominent green midrib: style bifid: stamens 3: achene obovoid, narrowed at the base, 1 mm. long (not including the style-base), shining-black; the surface minutely roughened: style-base half as wide as the achene, light-brown, with a dilated base and a narrow subulate beak: bristles 7–8, reddish-brown, of unequal length, some usually equalling the achene; the retrorse teeth small but very numerous.—Syst. ii. 154 (1817); Kunth, Enum. ii. 146 (1837); Boeckl., Linnaea, xxxvi. 460 (1869–1870); C. B. Clarke in Urban, Symb. Ant. ii. 64 (1900) and in Engler,

Bot. Jahrb. xxx. Beibl. 68: 18 (1901). *Scirpus maculosus* Vahl. Enum. ii. 247 (1805). *Eleogenus ocreatus* vars. *β2. albo-ater* and *β3. binocreatus* Nees in Mart. Fl. Bras. ii.[1] 102 and 103 (1842) acc. to Boeckl. (l. c.). *Eleogenus Schottianus* Nees in Mart. l. c. 102 (1842). *Eleocharis Schottiana* Steud. Syn. Cyp. 79 (1855). *Trichophyllum maculosum* House, Am. Midl. Nat. vi. 205 (1920).—I have seen no specimens from the United States or Mexico that can be identified with this species, although C. B. Clarke has referred *Berlandier* 2090 from Texas to *E. maculosa*.[1] The type collection (*Richard*) is from Guadaloupe, and the species is apparently of frequent occurrence in tropical South America. Specimens examined. GUADALOUPE: *Duss* 3911. COLOMBIA: Agua Sucia, alt. 1800 m., *Langlassé* 88; Dept. Santander, *Killip & Smith* 21134, 19549 (very young); west of Popoyan, alt. 1500–1700 m., Dept. El Cauca, *Pennell & Killip* 7196, 8166, 8237 (in small part). VENEZUELA: near Merida, 1700 m. alt., *Pittier* 12860 (U. S.). BRAZIL: Sao Paulo, Kneucker Exsic. Cyp. 193; Rio de Janeiro, *Wilkes Exped.* 1838–1842; Organ Mts., *Gardner* 720 (G, U. S.); Parana, *Dusén* 3751 (U. S.), *Glaziou* 16526 (U. S.); Bahia, *Salzmann* (U. S.).[2]

According to C. B. Clarke in Engler, Bot. Jahrb. (l. c.), E. VINCENTINA Philippi, Anal. Univ. Chil. xciii. 349 (1896), a Chilean species, differs from *E. maculosa* in shorter culms, pallid bristles (not rufescent), and in smaller spikelets (4–5 mm. long). It is said to differ from *E. ochreata* Nees (see *E. flaccida*) in castaneous spikelets and more rigid habit. *Philippi* 45 and 130 are cited by Clarke, and as synonyms *E. melanocarpa* Philippi, Linnaea, xxix. 85 (1857–1858); *E. hyalovaginata* Philippi, Anal. Univ. Chil. xciii. 352 (1896) and *Isolepis fuscopurpurea* Steud. Syn. Cyp. 99 (1855). *I. fuscopurpurea* is based on *Philippi* 265 from Valdivia, which is, however, described with a trifid style and without achenes. E. VINCENTINA var. ARCUATA C. B. Clarke (l. c.) has culms 5–14 cm. long, less rigid and often recurved. *Philippi* 46, 117 and 32 are cited, and in synonymy *E. arcuata* Kunze mss. ex Johow. from Juan Fernandez, *E. maculosa* Desv. in C. Gay, Fl. Chil. vi. 172 and *Scirpus Desvauxi* Philippi, Anal. Univ. Chil. xciii. 482 (1896).

54. E. INTRICATA Kükenthal. Rhizomes very slender, interwoven, and forming dense mats: culms 3–9 cm. high, compressed-quadrangular, striate, slender but firm, often recurved: sheath-apex hyaline, lax, attenuate: spikelet ovate to lance-ovate, 3–4 mm. long, about 5-flowered: scales not closely imbricated, rather acute, strongly keeled, with greenish-yellow midrib and brown sides;

[1] Britton, Journ. N. Y. Micr. Soc. v. 101 (1889).

[2] The Brazilian specimens differ consistently in having slender elongated culms and larger, thicker spikelets, with closely appressed scales.

the margins scarcely hyaline: achene obovate, 1 mm. long, shining-black, minutely punctulate, contracted at the base: style-base conic, acute, somewhat compressed, half as broad as the achene, of the same color as the bristles: bristles 6 or 7, exceeding the achene, white or light-brown, retrorsely scabrous; the bases united to form a prominent ring.—Kükenthal in Fedde, Rep. Spec. Nov. xiii. 135 (1914).—AFRICA: Nyassa-Highlands, Station Kyimbela, Rungwe, alt. 1600 m., *A. Stolz* 1132 (TYPE-COLLECTION, Ph.).

According to Kükenthal (l. c.) *E. intricata* is close to *E. olivacea* Torr. and *E. Sellowiana* Kunth, differing from the first in the shiny black achenes and from the latter in the smaller spikelets, color of the achenes, and the broader style-base.

Kükenthal (l. c.) also describes E. MAIDENII, a new species from New South Wales: Byron Bay (*W. Forsyth*); Centennial Park, Port Hacking (*A. Hamilton*). The achene is olive-green when mature, but is smaller than that of *E. olivacea.* The bristles are scarcely longer than the achene. The sharply-keeled scales clearly separate it from *E. olivacea* and *E. Sellowiana. E. intricata* is separated from *E. Maidenii* by the less membranous sheaths and the black achenes. From the same region E. MAIDENII var. SUBAQUATICA Kükenthal is described. This has flaccid culms up to 30 cm. in height and the spikelet is at times proliferous. I have seen no specimens.

55. E. DEBILIS Kunth. FIG. 41. Culms numerous, 15–20 cm. long, sub-capillary, lax: upper sheath membranous, truncate: spikelet ovate, 3–4 mm. long, 10–15-flowered, acute: scales ovate-elliptic, narrowed toward the apex, rather blunt, pale-brown, with a prominent green keel: style 2-fid: stamens 3: achene obovate, 1–1.3 mm. long, smooth, black (yellow when immature), with a short conical tubercle dilated at the base: bristles 6 or 7, brown, slender, retrorsely toothed, somewhat exceeding the achene.—Enum. ii. 143 (1837); Nees in Mart. Fl. Bras. ii.[1] 104 (1842); Boeckl. Linnaea, xxxvi. 434 (1869–1870); Lindman, Regnell. Cyp. 15, t. 2, fig. 4 (1900); Palla in Wettstein, Exped. Kaiserl. Akad. Südbrasil. i. 172 (1908).

The original collection was by *Sello* in Rio de Janeiro. The only specimen which I have examined is *Mosén* 3510 (S), collected at Santos, Sao Paulo (det. by C. B. Clarke and figured in Lindman, Regnell. Cyp. l. c.). This plant is readily distinguished from other members of the section by the capillary culms and broad greenish spikelets.

Forma MACRA (Kunth) Boeckl. Spikelets much smaller and paler, 3–5-flowered.—Boeckl. acc. to Kükenthal, Fedde, Rep. Spec.

Nov. xxiii. 192 (1926). *E. macra* Kunth, Enum. ii. 142 (1837). *E. debilis*, form (without name) Boeckl. Linnaea, xxxvi. 435 (1869–1870).—Brasil: Brasilia Merid. prope Yriró, *Sellow*.

I have seen no specimens. Kükenthal cites this form from Cuba, citing *Ekman* 2146, Prov. Oriente, Sierra de Nipe, Rio Piedra.

Species doubtful or not seen[1]

See discussions under *E. intricata* and *E. flaccida*.

E. yunquensis Britton in Britton & Wilson, Bot. Porto Rico and Virg. Isl. 92 (1923) is closely related to *E. debilis*.

E. Pittieri Boeckl. Allg. Bot. Zeit. ii. 35 (1896). Based on *Pittier* 548 (specimen seen in herb. U. S.) from Costa Rica. Close to *E. Schaffneri* Boeckl. but apparently a distinct species.

E. Lehmanniana Boeckl. Engler, Bot. Jahrb. viii. 205 (1887). Based on *Lehmann* 138 from Ecuador (Spec. seen in herb. U. S.). A distinct Andean species.

I have seen material of these species too late to include them in the present treatment.

Geographical Distribution of Series Maculosae

The members of series Maculosae, sub-series Rigidae are most abundant in the New World, from Texas to Florida and the West Indies, *E. microformis*, *E. praticola*, and *E. bahamensis* being confined to the area, and *E. caribaea* and *E. atropurpurea* likewise occurring in the region. Especially in the West Indies there is difficulty in the precise delineation of species and their nomenclature. *E. caribaea* is distributed in coastal sands, and often in the interior, throughout the tropics and forms a large percentage of the collections of *Eleocharis* from tropical regions. *E. atropurpurea* reaches into the

[1] The following species, superficially resembling *E. capillacea*, belongs to a series (Tenuissimae) not specially treated in the present paper.

56. E. **alveolata**, n. sp., dense caespitosa; culmis 2–5 cm. longis, capillaribus, acutis angulatis, a punctis minutis brunneis inspersis, fere recurvatis; vaginis atrosanguineis, firmis, ad apicem paullo inflatis; spiculis linearibus, acutis, 2–3 mm. longis, fere sterilibus; squamis 3–4, elongatis, valde carinatis, brunneis, margine hyalinis; stylo 3-fido; staminibus 3; achaeniis in basi culmorum sitis, acutis trigonis, 1–1.3 mm. longis (cum stylobasi), apice basique angustatis, basi stipitatis, nitido-olivaceis, cancellatis; stylobasi trigona, conica, elongata, nigrescente, ad basin latiore; setis nullis.—Cuba; Brazil. Cuba: vicinity of Colombia, Isle of Pines, *Britton*, *Britton & Wilson* 15621; in pinelands, Herradura, Pinar del Rio, *Ekman* 17788 (type in Gray Herb.; specimen also S); forming vast colonies in pinelands, Mendoza, *Ekman* 18761 (S); in white sand at shore of Laguna Sta. Barbara, *Ekman* 18111 (S); Sierra de Nipe Oriente, *Ekman* 5763 (S); *C. Wright* 3367, in part. Brazil: in vicinibus Santarem, Prov. Parà, "Scirpidium (4), September 1850," and "Scirpidium (5), July 1850," *Spruce*.

This species superficially resembles *E. capillacea*, Kunth (with which it has been confused by many writers), differing in the lack of an extensive rhizome, and in the presence of trigonous cancellate achenes. It belongs to an entirely different section, and stands between *E. retroflexa* and *E. Baldwinii*.

temperate regions of Europe and North America, but its occurrence is sporadic.

The sub-series OCREATAE likewise has its center of distribution in the New World. The species are almost entirely confined to the tropics, but one extra-tropical species, *E. olivacea*, extends along the Atlantic coastal plain and spreads out into the glaciated region of eastern North America. Another species, *E. flaccida*, is found in the hot springs at Yellowstone Park. The Brazilian species of this group are not clearly understood. Members are also found in Africa, Madagascar, and Australia.

EXPLANATION OF PLATE 191

(Achenes × 15)

Fig. 39, ELEOCHARIS SCHAFFNERI, Mexico, *Schaffner* 575; 40, E. MACULOSA, Guadaloupe, *Duss* 3911; 41, E. DEBILIS, Brazil, *Mosén* 3510; 42, E. SELLOWIANA, Paraguay, *Ostén* 7882; 43, E. OLIVACEA, Rhode Island, *Olney;* 44, E. EKMANII, Cuba, *Ekman* 19,015; 45, E. MICROFORMIS, Texas, *Buckley;* 46, E. PRATICOLA, Florida, *Fredholm* 5820; 47, E. FLACCIDA, Martinique, *Hahn* 703; 48, E. CARIBAEA, Porto Rico, *Sintenis* 1219; 49, E. ATROPURPUREA, Georgia, *Harper* 1934; 50, E. CAPILLACEA, Brazil, *Sellow;* 51, E. BAHAMENSIS, Bahama, *Small & Carter* 8807.

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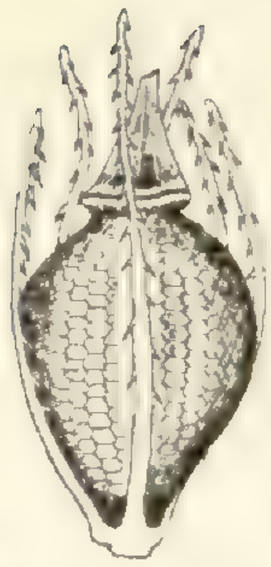
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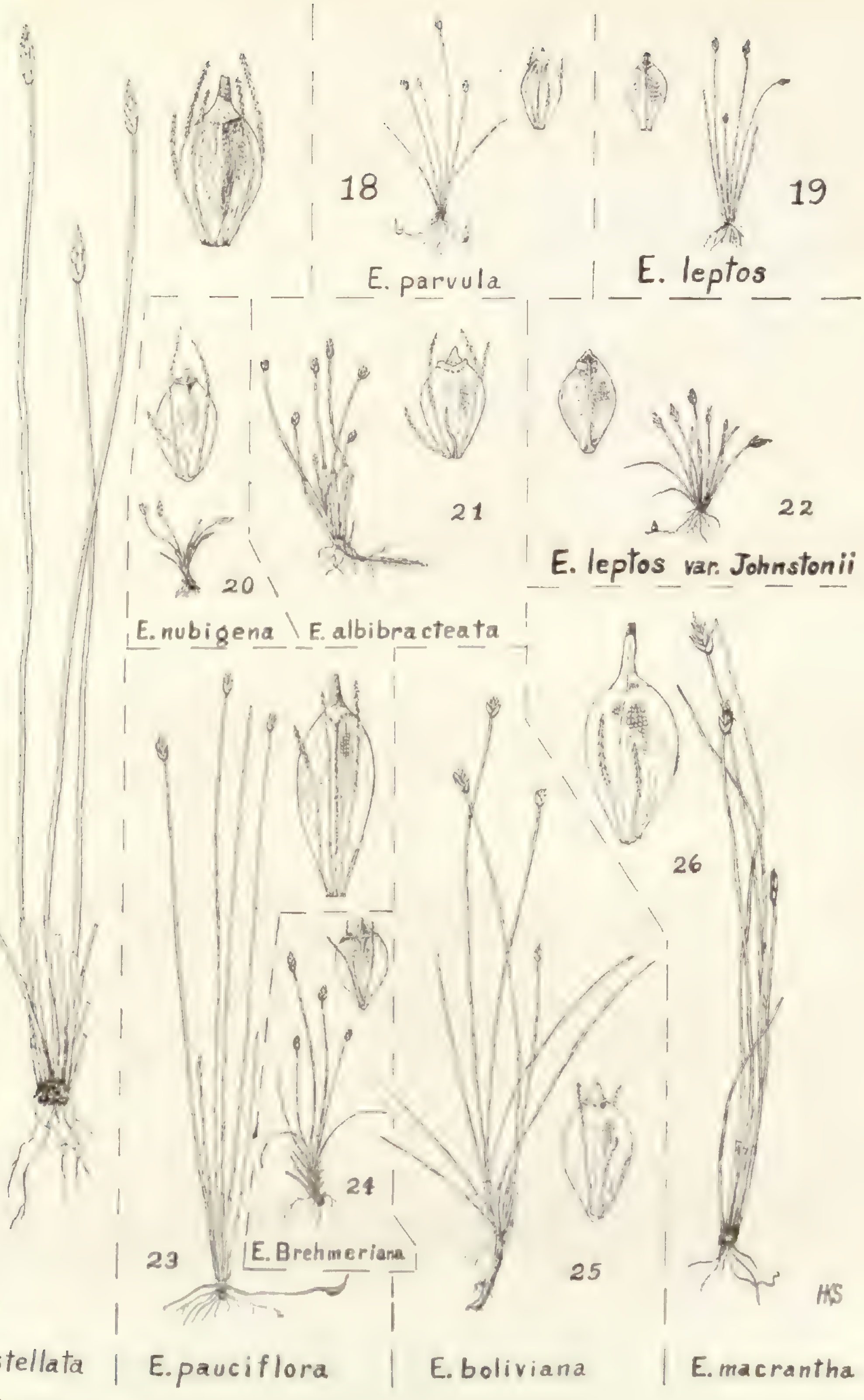
H. K. Svenson del.

Eleocharis, series Mutatae

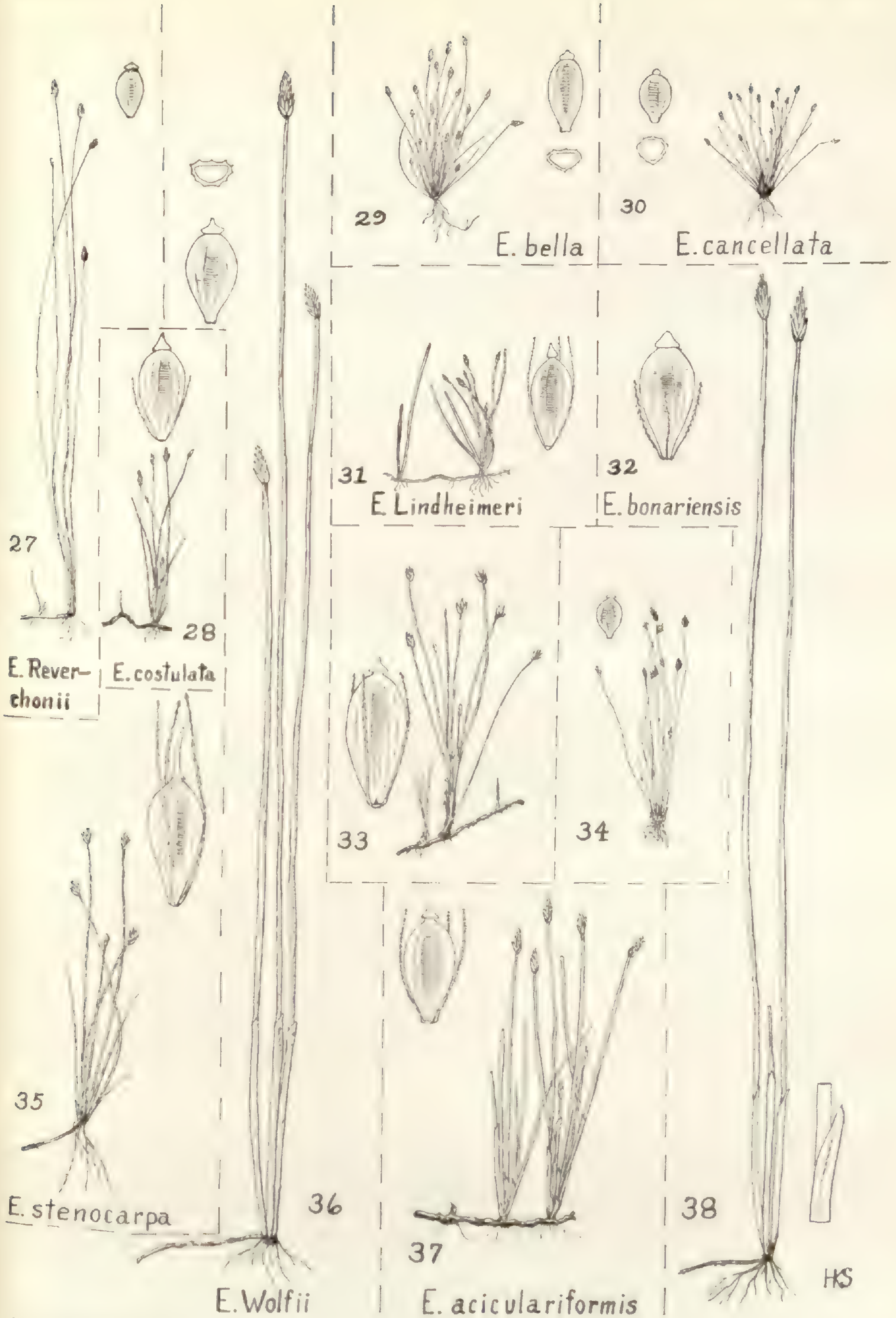
(Achenes × 10)

Fig. 1, E. equisetoides; 2, E. interstincta; 3, E. fistulosa; 4, E. quadrangulata; 5, E. Robbinsii; 6, E. elongata; 7, E. plicarhachis; 8, E. mutata; 9, E. philippinensis; 10, E. variegata var. laxiflora; 11, E. cellulosa; 12, E. spiralis; 13, E. fistulosa var. robusta; 14, E. equisetina; 15, E. sphacelata; 16, E. dulcis.



Eleocharis, series Pauciflorae

(Habit-drawings × ½; achenes × 15, except fig. 17, × 10)



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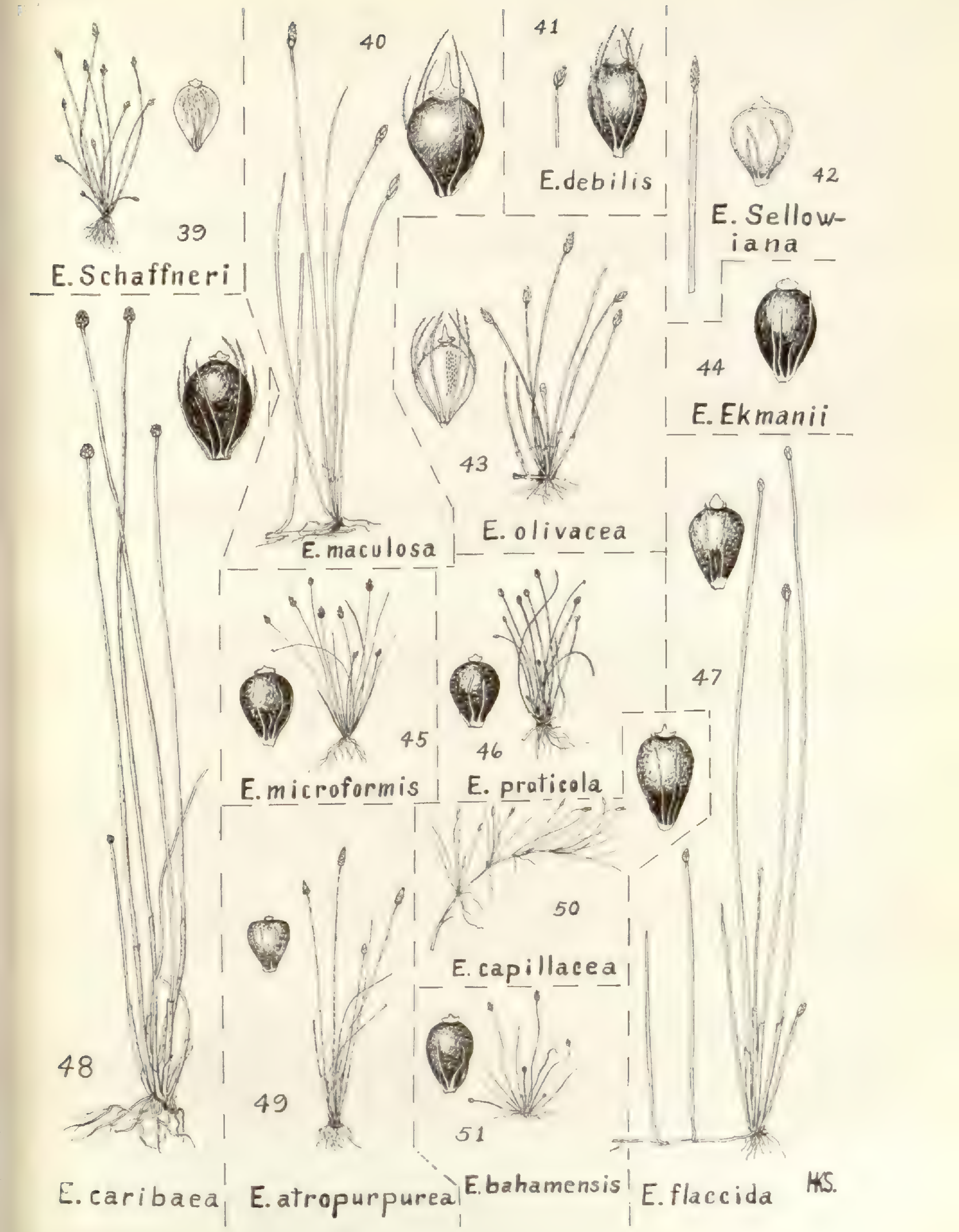
ELEOCHARIS, SERIES ACICULARES

(Achenes × 15)

FIG. 27, E. REVERCHONII; 28, E. COSTULATA; 29, E. BELLA; 30, E. CANCELLATA; 31, E. LINDHEIMERI; 32, E. BONARIENSIS; 33, E. NERVATA; 34, E. BRACHYCARPA; 35, E. STENOCARPA; 36, E. WOLFII; 37, E. ACICULARIFORMIS; 38, E. BONARIENSIS.



H. K. Svenson del.

ELEOCHARIS, SERIES MACULOSAE

Reprinted from RHODORA, Vol. 32, January to April, 1930

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXVII

I. LIGUSTICUM SCOTHICUM OF THE NORTH ATLANTIC AND OF THE NORTH PACIFIC

M. L. Fernald

(Plates 193 and 194)

The Scotch Lovage, *Ligusticum scothicum* L., is generally treated as having two widely separated areas of distribution, one on the North Atlantic: the coasts of Scandinavia, the British Isles and Iceland at the east and of southern Greenland, Labrador, eastern Canada, New England and southeastern New York at the west; the other on the North Pacific: southern Alaska and Kamtchatka to Japan. The two areas are, obviously, quite isolated; and, whenever I have had for identification material from the North Pacific, I have at first failed to recognize it as *Ligusticum scothicum*, for in its small and compact convex-topped flowering umbels it has always seemed very different from the plant I have intimately known for forty years on the shores from Long Island to Labrador, the latter plant having the primary umbels much broader and flat-topped. From time to time I have undertaken a closer comparison of the plants of these two remote areas but, owing to lack of mature fruit of the plant of the North Pacific, have as regularly abandoned the study. Recently, however, realizing that the great student of the Kamtchatkan flora, Dr. Eric Hultén of the Riksmuseum at Stockholm, must have before him abundant material of both plants, I referred the question to him. My attempt thus to delegate the problem, however, proved a "boomerang"; Dr. Hultén responded by supplying me with excellent fruiting material from Kamtchatka and from Japan, thus encouraging me to look further into the question. The result of this renewed study is the proposal of

Ligusticum **Hultenii,** n. sp. (t. 194), *L. scothicum* simulans; foliolis

foliorum inferiorum subrotundatis vel late rhomboideis 1–7 cm. longis crenato-dentatis, venulis plerumque confluentibus areolas clausas formantibus; umbellis hemisphaericis ad anthesin convexis primariis 3–5.5(–7) cm. latis; fructu anguste oblongo 8–10 mm. longo 2–2.5 mm. lato.—Alaska and Kamtchatka to Japan. ALASKA: Fort St. Michael, Norton Sound, 1865–66, *H. M. Bannister;* False Pass, Alaska Peninsula, August 3, 1925, *O. J. Murie*, no. 67; Lake Iliamna region, 1902, *Gorman*, no. 114; Ocean Cape, Yakutat Bay, July 18, 1892, *Funston*, no. 70; grassy edge of woods, Prince of Wales Island, August 8, 1915, *Walker*, no. 916a; Sitka, *Mertens;* shore, Sitka, August 8, 1907, *Cowles*, no. 1089; Ilinlink, Unalaska, September, 1871, *M. W. Harrington;* Unalaska, July 25, 1891, *J. M. Macoun;* on moisture-bathed rock or in moist lowlands along streams, Unalaska, July 6, 1907, *Van Dyke*, no. 7; moist places, Makushin Bay, Unalaska, July 14, 1907, *Van Dyke*, no. 169; Amchitka Island, July 25, 1873, *Dall;* Nazan Bay, Atka, July 26, 1907, *Van Dyke*, no. 238 (TYPE in Gray Herb.); Akutan, August 21, 1907, *Van Dyke*, no. 325. KAMTCHATKA: Petropavlovsk, 1853–56, *C. Wright*, August 17, 1920, Hultén, no. 932. JAPAN: Kokodate, 1859, *Wilford*, 1861, *Maximowicz*, July 10, 1890, *Miyabe & Tokubuchi;* Sapporo, July 7, 1903, *Arimoto*.

Named for Dr. Eric Hultén, whose critical studies of the flora of Kamtchatka are clearing the identities of plants of many other sections of the northern hemisphere.

Superficially, *Ligusticum Hultenii* is at once separated from well-developed *L. scothicum* by the smaller and more rounded crenate-dentate leaflets of the lower leaves and the very small and convex umbels. The lower leaves of *L. scothicum* of shores of the North Atlantic have the leaflets usually narrower, more cuneate at base, more cleft and commonly acute to acuminate and more serrate-dentate (though in small northern forms they may be crenate), and the lower leaflets are often 1 (sometimes even 1.5) dm. long; and the primary umbels of *L. scothicum* are broader, in anthesis 4–10 cm. broad and essentially flat on top. The fruit of *E. Hultenii* is slightly but appreciably narrower, the mature merocarps 2–2.5 mm. wide, while in *L. scothicum* they are 2.5–4 mm. broad. Probably the most positive difference in the foliage is found in the venation of the leaflets of the lower leaves: in *L. scothicum* (Plate 193) the larger veinlets are confluent, thus forming areolae, but a large proportion of the ultimate ones have free ends; in *L. Hultenii* (Plate 194) most of the veinlets of the lower leaves are confluent, forming areolae. This difference is clearly brought out in the micro-photographs kindly prepared by Mr. Albert N. Steward.

Explanation of Plates 193 and 194

Plate 193, upper fig., basal leaflet of Ligusticum scothicum, to show venation, × 3; lower fig., venation × 20. Plate 194, upper fig., basal leaflet of L. Hultenii, to show venation, × 3; lower fig., venation, × 20.

II. CAREX MACROCEPHALA AND C. ANTHERICOIDES

M. L. Fernald

Dr. Charles W. Townsend sent me in November last a much battered "pocket specimen" of a grass-like plant which he had found "on a sand dune near Seaside Park, near Tom's River, New Jersey," with the additional information that "it was said to have spread rapidly over the dune, and that it was never planted there . . . The care-taker of the property thought it would be an excellent sand binder, which it appears to be, as it makes a close mat." The plant had nearly cylindric culms and no fruit, so, taking it upon casual inspection to be a grass, I sent half the material to Mrs. Agnes Chase for identification. In the absence of Mrs. Chase, the plant was examined by Mr. E. C. Leonard who has correctly identified it as *Carex macrocephala* Willd. of the sandy coast of eastern Asia, from eastern Kamtchatka, Sachalin Island and Japan to Shantung. It is apparently quite at home on the New Jersey sands, for Mr. J. R. Swallen of the Bureau of Plant Industry writes: "This is the second specimen that has been sent in from New Jersey."

Carex macrocephala is generally supposed to occur on the Pacific coast of North America, from southern Alaska to Oregon; but Dr. Townsend's material so closely matches the Asiatic specimens and so far departs from the fine series in the Gray Herbarium from the sands of British Columbia, Washington and Oregon that I have compared the two series with some care. It now becomes clear that the plant of western North America is a thoroughly distinct species, for more than a century wrongly identified with the Asiatic *C. macrocephala*. The American species is C. anthericoides Presl., Rel. Haenk. 204 (1828), originally collected at Nootka Sound on Vancouver Island; and it is distinguished from the Asiatic by characters of the rootstock, lowest leaves, rosette-leaves, culm, scales, anthers and achenes. The original description by Willdenow of the Asiatic plant was meagre, but the very complete description of true *C. macrocephala* given by Regel[1] and beautifully illustrated by him may be compared

[1] Regel, Tent. Fl. Ussur. 164, t. xii. figs. 8–12 (1861).

with the equally full original description by Presl of his *C. anthericoides* or the beautiful plate (as *C. macrocephala*) of Francis Boott.[1] The Regel and Presl descriptions and the Regel and Boott plates accurately portray the two species, while Kükenthal's description[2] was based primarily upon Asiatic material and Mackenzie's description and accurate figure of the American plant in Abrams's Illustrated Flora[3] are drawn from American specimens.

The rootstock of *C. macrocephala* soon loses the shredded sheaths, that of *C. anthericoides* retains them tightly investing the internodes. In *C. macrocephala* the leafy shoots have few if any bladeless basal leaves, and the bases of the true foliage-leaves quickly disintegrate into fibres ("Culmi . . . basi fibris foliorum emarcidorum vestiti"—*Regel*); in *C. anthericoides* the basal leaves are reduced, dry and bladeless and they, as well as the long green leaves above them, rarely if ever disintegrate into fibres. In *C. macrocephala* the upper leaf-surface is scarcely ribbed, in *C. anthericoides* prominently so; in *C. macrocephala* the fresh leaf-margins are coarsely (often papillately) toothed ("Folia . . . marginibus grosse serrata"—*Kükenthal*), in *C. anthericoides* the serration is much finer and spinulose ("margins minutely but sharply serrulate"—*Mackenzie*). The culm of *C. macrocephala* is very obtusely angled, almost cylindric, and smooth ("Culmi . . . obtuse triangulares, leaves, glabri"—*Regel;* "Culmus . . . obtusangulus laevis"—*Kükenthal*); the culm of *C. anthericoides* harshly serrate on the sharp angles ("Culmus . . . triqueter striatus angulis serrato-scaber"—*Presl;* "*Culmus* . . . triqueter, scaber"—*Boott;* "Culms . . . often strongly roughened on the angles"—*Mackenzie*). In *C. macrocephala* the scales of the spikes are herbaceous and greenish, with pale firm borders, becoming drab, and they are conspicuously toothed on the margin ("Squamae . . . praecipue apicem versus serrulatae, herbaceae,"—*Regel;* "Squamae . . . in acumen . . . marginibus eroso-denticulatum attenuatae"—*Kükenthal*); in *C. anthericoides* the scales have thin, scarious or hyaline brown sides and, except for the outer bracteal ones, are quite entire ("Glumae . . . dorso nervoso-striatae virescentes, margine fuscae"—*Presl;* "squama . . . ferruginea"—*Boott;* "scales . . . brownish with green center and hyaline margins"—*Mackenzie*), the margins beautifully

[1] Boott, Ill. Carex, i. 27, t. lxix (1858).
[2] Kükenthal in Engler, Pflanzenr. iv[20]. 187 (1909).
[3] Mackenzie in Abrams, Ill. Fl. i. 293, fig. 691 (1923).

shown in the illustrations cited, Regel's fig. 12 of the Asiatic plant showing the characteristically toothed scale, Boott's figs. *c*, *g* and *h* and Mackenzie's figure of the American correctly representing entire scales. The anthers of the Asiatic *C. macrocephala*, as shown by 4 staminate inflorescences before me, are 4.5–6 mm. long; in the American *C. anthericoides*, as shown by Boott's illustration and by several sheets of specimens, only 2–3.3 mm. long. The achene of the Asiatic *C. macrocephala* tapers to the base, that of the American is strongly rounded at both ends, as clearly shown in Boott's figs. *ff*.

Altogether, the specific distinctness of the plants of the two sides of the North Pacific is apparent. Geographically they parallel numerous other cases and it is at least worth noting that true *Carex macrocephala*, now establishing itself on the Atlantic coast of North America comes from the same region as the other sea-shore species, *Artemisia Stelleriana* Besser, which has rapidly fixed itself upon our coastal dunes and beaches. It is also not without interest that the coarse Sand Reed or Psamma of Atlantic America, *Ammophila breviligulata* Fernald[1] should have proved to be specifically quite unlike the European *A. arenaria* (L.) Link; but that the European, rather than the Atlantic American, plant should have made itself at home on the Pacific coast of North America.

[1] Fernald, Rhodora, xxii. 71 (1920).

(To be continued.)

CONTRIBUTION FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXVII

(*Continued from page 11*)

III. A REVISION OF SOME NORTH AMERICAN SPECIES OF CALAMAGROSTIS

G. L. Stebbins, Jr.

(Plate 195)

The genus *Calamagrostis* is well known to students of grasses as one in which the species are exceedingly variable and difficult to define. The North American species, mostly boreal or alpine in distribution, have been studied by a number of the best known American grass specialists, in particular Dr. George Vasey, Dr. F. Lamson Scribner, and Dr. T. H. Kearney. The first attempt at a complete classification of the genus in North America, however, was made by Dr. Kearney in 1898.[1] This monograph did a great deal toward clearing up the confusion of names that had existed before this time, and it is the basis for the treatment of the genus in most of the manuals and local floras now in use.

The subdivision of the genus in Kearney's monograph is in many ways unsatisfactory, since it is based to a considerable extent on characters such as the expansion or contraction of the panicle and the flatness or involuteness of the leaves, characters which obviously vary with the habitat of the plant, and, in herbarium specimens, the manner in which the specimen was prepared. For a more sound

[1] T. H. Kearney—The Genus Calamagrostis in North America, Bull. U. S. Dept Agric. Div. Agrost. xi. (1898).

subdivision of the genus it seems advisable to turn to European works, in which a number of subgenera and sections have been described. The treatment in Ascherson & Graebner's "Synopsis der Mittel-Europäischen Flora" (Vol. II, part 1, pp. 197–223) is probably the most satisfactory, and the description there given of the sections of the division *Quinquinerviae* of the subgenus *Eucalamagrostis*, the only division extensively represented in North America, is therefore quoted in translation:

a. *Quinquenerviae* T o r g e s Thür. BV. N. F. XII f. 1898. 23 [1899]). Glumes lanceolate, acuminate. Lemmas mostly 4-nerved above the insertion of the awn.

1. *Calamágris* (Dumortier Agrostogr. Belg. 126 [1823]. *Homoeotricha* T o r g e s Thür. BV. N. F. XII f. 1898 23 [1899]). Callus-hairs spread equally around the callus, forming a closed ring of hairs, and of equal length all around (the larger and straighter ones scattered throughout). Lemma considerably, mostly ⅓, shorter than the lower glume, completely, or at least in the upper ½ or ⅓ translucent-membranaceous. Awn delicate, straight, only in rare exceptions weakly geniculate. Palea considerably shorter than the lemma. Rhachilla not prolonged behind the floret, or the prolongation persisting as a short (rarely longer) hairy (rarely glabrous) little point.

2. *Deyeuxia* ([Clarion in P. B. Essai d'une nouvelle Agrost. 43. t. IX fig. 9, 10 [1812] as a Genus]. Torges Thür. BV. N. F. XII f. 1898 23 [1899] as a Section). Callus-hairs quite or almost completely interrupted below the middle of the lemma (through one group of scanty probably shorter hairs), the longest hairs situated on either side of the lemma and more or less crowded together, appearing tufted. Lemma almost always very slightly shorter (⅙–⅛) than the lower glume, toward the tip, the edges, and between the nerves translucent, otherwise chartaceous, herbaceous and more or less firm. Awn setiform, distinctly geniculate and twisted above the base, or straight and only exceptionally and indistinctly geniculate and weakly twisted. Palea little to considerably shorter than the lemma. Rhachilla always prolonged behind the base of the floret, above (in our species) with brush-like hairs.

a. Orthoátherae Torges Thür. BV. N. F. XII (1898). 24 (1899). Awn straight, only exceptionally indistinctly geniculate. Palea considerably (¼–⅓) shorter than the lemma.

b. Ancylátherae (Torges Thür. BV. N. F. XII [1898]. 24 [1899]). Awn geniculate and twisted. Palea almost as long as the lemma.

These subdivisions seemed to be based on more fundamental characters than those of Kearney, and a revision of § *Calamagris*, and § *Deyeuxia*, Subsect. *Orthoatherae* was undertaken with them as a basis. The *Ancylatherae*, most highly developed in the Condilleran Region and in South America, have been omitted on account of their great complexity and their scant representation in eastern America.

It was soon found, however, that some of the characters mentioned above do not hold for the American species. *Calamagrostis Scribneri*

Beal has the short, unequal callus-hairs of § *Deyeuxia*, although its thin, translucent-membranaceous lemma would place it in § *Calamagris*, and its habit is most nearly like that of *C. canadensis*, our most widely spread representative of that section. The lemma is, moreover, just as much shorter than the glumes in the species of *Deyeuxia* as in *Calamagris*, while the prolongation of the rhachilla is present in all species, and is quite as long in some varieties of *C. canadensis* (Michx.) Nutt. as in the majority of the species of the section *Deyeuxia*. The fundamental character separating the two sections, however, the texture of the lemma, is a constant one which, together with the difference in general habit, separates them quite definitely.

This paper deals with the species of the section *Calamagris* and of the subsection *Orthoatherae* in North America. The species are all highly variable, and intermediate forms between many of them were found. In fact, it would probably be possible in any of the subsections to form a continuous series of forms differing but slightly from each other which would include all of the species of the subsection. Species have, therefore, been recognized wherever a clearly definable entity exists with a definite range, and with only a few intermediates between it and closely related forms. Where species already described have been found to pass imperceptibly into related species, with many intermediates where their ranges overlap, it has seemed advisable to relagate them to varieties, even though, in their typical forms, they are quite distinct from each other. *Calamagrostis Langsdorfi* (Link) Trin. is therefore treated, following Inman (RHODORA, xxiv. 143), as a variety of *C. canadensis* (Michx.) Nutt., while *C. Macouniana* Scribn. and *C. micrantha* Kearney have been made varieties of *C. canadensis* and *C. neglecta* (Ehrh.) Gaertn. respectively.

In view of these facts, there is little doubt that closely related species of this genus hybridize with each other, and that this is one cause of the complexity of the genus. Some of the species which have been collected only once or twice may be hybrids between more distantly related species, while a few forms obviously intermediate in their characters will be discussed as such.

The following treatment is the result of the examination of the specimens in the Gray Herbarium, the herbarium of the New England Botanical Club (cited as N. E.) and of the types and the more critical specimens in the United States National Herbarium (cited as U. S.), the herbarium of the New York Botanical Garden, and the National Herbarium of Canada.

KEY TO THE SPECIES OF CALAMAGROSTIS § CALAMAGRIS AND § DEYEUYIA, SUBSECTION ORTHOATHERAE IN NORTH AMERICA

a. Panicle mostly loose and open; the branches spreading at flowering time: lemma membranaceous-translucent, at least in its upper third: the nerves prominent: awn straight. . . . *b.*

b. Sheaths glabrous at the summit: tip of the lemma erose or 4-toothed; the teeth obtuse or acute: callus-hairs equalling or exceeding the lemma, of approximately equal length, except for an outer ring of shorter hairs. . . . . 1. *C. canadensis.*

b. Sheaths bearded at the summit, or more rarely glabrous: lemma sharply 4-toothed; the teeth acuminate through the excurrence of the nerves: callus-hairs distinctly shorter than the lemma, somewhat unequal in length. . 2. *C. Scribneri.*

a. Panicle sometimes loose and open, more generally narrow and contracted; its rigid branches appressed or ascending even at flowering time: lemma firm and opaque, if occasionally translucent the awn strongly bent and twisted; the nerves frequently indistinct: callus-hairs usually shorter than the lemma, of markedly unequal length; those at the sides of the lemma distinctly longer and tufted: awn straight, or bent and twisted. . . . *c.*

c. Awn straight or slightly bent: palea ⅔–⅘ as long as the lemma. . . . *d.*

d. Prolongation of the rhachilla bearded only at the summit: caryopsis pubescent, particularly at the summit. 3. *C. cinnoides.*

d. Prolongation of the rhachilla bearded throughout its length: caryopsis glabrous. . . . *e.*

e. Leaves broad, flat and lax: glumes translucent, pale and whitish: palea 3.5–4 mm. long, ⅘ as long as the lemma. . . . . 4. *C. scopulorum.*

e. Leaves firmer and more rigid, flat or involute: glumes opaque, or if translucent distinctly green, yellowish, or purple-tinged: palea rarely over 3 mm. in length. . . . *f.*

f. Foliage and culms harsh and scabrous: ligules of the upper culm-leaves 2.5–8 mm., averaging 4 mm., long; their margins erose or lacerate. . . . *g.*

g. Branches of the panicle slender and flexuous, very slightly scabrous: spikelets 3 mm. long: prolongation of the rhachilla 0.5 mm. long. . 5. *C. lucida.*

g Branches of the panicle stout, rigid, strongly scabrous: spikelets 3–6 mm. long: prolongation of the rhachilla 0.6–1.5 mm. long. . . . . 6. *C. inexpansa*

f. Foliage smooth, the leaves occasionally scabrous on the tip, the margin, and the upper surface: ligules of the upper culm-leaves 1.5–3.5, averaging 2 mm., long: their margins entire or slightly erose, truncate. . . . *h.*

h. Culms stout: culm-leaves 3–4 mm. broad, flat or involute: panicle short and very dense, 5–8 cm. long. . . . *i.*

i. Culm-leaves involute, at least in drying, 4–13 cm., the upper averaging 4–6 cm., long: glumes very thick and broad, 2 mm. broad when laid out flat: palea ⅘ as long as the lemma: species of the Pacific Coast. 7. *C. crassiglumis.*

i. Culm-leaves flat, 10–14 cm., the upper averaging 10–12 cm., long: glumes thinner, often hyaline at the tip and on the margins, narrower: palea ¾ as long as the lemma: species of Greenland....8. *C. hyperborea.*

h. Culms more slender: culm-leaves 2–3 mm. broad, involute at least in drying, if occasionally flat and over 3 mm. broad, the panicle loosely flowered and 9–15 cm. long.*j.*

j. Glumes thick and opaque, 1.4–1.8 mm. broad when flattened out: branches of the panicle very short, the longest ⅕ its length.....9. *C. labradorica.*

j. Glumes hyaline and translucent, at least at the tip and on the margins, 1–1.2 mm. broad: branches of the panicle mostly longer, ⅕–⅓ its length....*k.*

k. Spikelets 2–4.8 mm. long:[1] lemma 1.8–3.8 mm. long: palea 1.2–2.5 mm. long: awn straight.....10. *C. neglecta.*

k. Spikelets 4.5–5.5 mm. long: lemma 3.8–4 mm. long: palea 2.8–3 mm. long: awn curved or weakly geniculate, not twisted.....11. *C. lapponica.*

c. Awn strongly, or at least once or twice twisted at the base, and distinctly bent or geniculate: palea nearly or quite equalling the lemma.....Subsection *Ancylatherae.*

1. Calamagrostis canadensis (Michx.) Nutt. Gen. i. 46 (1818). A very variable species, of which the following are well marked varieties:

a. Glumes green or purple-tinged, equal or nearly so: awn inserted on the lower two-thirds of the lemma....*b.*

b. Spikelets 2–3.8 mm. long: glumes rounded on the back, weakly keeled, acute or acuminate: lemma 1.7–3 mm. long: awn inserted near the middle of the lemma....*c.*

c. Panicle loosely flowered: spikelets 2.8–3.8 mm. long: glumes distinctly exceeding the lemma, acute or acuminate.....Var. *typica.*

c. Panicle densely flowered: the ultimate branchlets short and and appressed: spikelets 2.2–2.8 mm. long: glumes nearly or quite equalled by the lemma, obtuse or acute. Var. *Macouniana.*

b. Spikelets 3.8–6 mm. long: glumes narrow, strongly keeled, and distinctly acuminate: lemma 3–4.2 mm. long: awn inserted on the lower third of the lemma....*d.*

d. Spikelets 3.8–4.5 mm. long: glumes often hyaline on the tip and on the margin, short-scabrous on the keel, elsewhere minutely pubescent-scabrous: lemma 3–3.5 mm. long.....Var. *robusta.*

d. Spikelets 4.5–6 mm. long: glumes usually thick and opaque throughout, scabrous or ciliate on the keel, elsewhere pubescent: lemma 3.5–4.2 mm. long....*e.*

[1] In all the species, the length of the spikelets varies considerably in the same panicle, those at the base being considerably shorter than those at the summit. For the sake of uniformity, the measurements are in every case based on spikelets taken from the middle of the panicle.

e. Culm-leaves broad and flat; their ligules 4–10 mm. long: panicle expanded at flowering time: glumes ciliate on the keel, elsewhere distinctly and rather densely pubescent.....Var. *Langsdorfi.*

e. Culm-leaves involute, at least in drying; their ligules 1.5–3 mm. long: panicle narrow and contracted, even at flowering time: glumes short-scabrous on the keel, elsewhere minutely and sparsely pubescent..Var. *arcta.*

a. Glumes membranaceous and translucent on the tip and the margins, pale-green or whitish, distinctly unequal, the upper more acuminate than the lower: awn inserted on the upper fourth of the lemma, considerably exceeding it.....Var. *pallida.*

Var. **typica.** *C. canadensis* (Michx.) Nutt., as to synonymy. *Arundo canadensis* Michx. Fl. Bor.-Am. i. 73 (1803). *Agrostis mexicana* Pers. Syn. i. 76 (1805). *C. canadensis?* Beauv. Agrost. 157 (1812), as *nomen nudum*. *Arundo agrostoides* Pursh, Fl. Am. Sept. i. 86 (1814). *C. mexicana* Nutt. Gen. i. 46 (1818). *C. agrostoides* Trin. Gram. Unifl. 228 (1824). *Cinna? Purshii* Kunth, Enum. i. 208 (1833). *Arundo fissa* Willd., Steud. Nom. ed. 2, i. 44 (1840). *Calamagrostis Michauxii* Trin., Steud. Nom. ed. 2, i. 250 (1840). *C. canadensis campestris* Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 31 (1898). *C. inexpansa cuprea* Kearney, ibid. 37 (1898).—Newfoundland to British Columbia, south to Delaware, Ohio, Missouri, New Mexico, and California. The following are typical: Newfoundland: talus of sandstone cliffs, Western Bay, Conception Bay, *G. S. Torrey*, no. 112. Quebec: Rivière Moisie, sur les alluvions près de l'embouchure, *Victorin & Rolland*, no. 18,200; Ile Plâte, near Montreal, *Victorin*, no. 734; swamp, Ascot, Sherbrooke Country, *E. B. Chamberlain & C. H. Knowlton*, July 29, 1923; Arbor Vitae swamp west of Locked Camp, Rivière Cap Chat, Matane County, *M. L. Fernald & L. B. Smith*, no. 25,478; tourbière, Pointe Sud Ouest, Anticosti, *Victorin & Rolland*, no. 24,372. New Brunswick: Shediac Cape, *F. T. Hubbard*, no. 722; Lily Lake, St. John's, *William Boott*, August 8, 1873. Maine: Green Mt., Mt. Desert Island, *E. & C. E. Faxon*, July 26, 1888; Kennebunkport, *G. G. Kennedy*, July 18, 1888. New Hampshire: in deep, wet woods, Jaffrey, *B. L. Robinson*, no. 353; roadside north of Crawford House, *E. & C. E. Faxon*, July 27, 1895; Breezy Point, Warren, *E. F. Williams*, July 24, 1908. Vermont: along the Connecticut River, Norwich, *E. F. Williams*, July 11, 1910; Smuggler's Notch, *C. E. Faxon*, August 10, 1877. Massachusetts: Revere, *H. A. Young*, June 24, 1879; Neponset Meadow, Canton, *G. G. Kennedy*, June 26, 1894; Holbrook, *J. M. Greenman*, no. 3152. Rhode Island: Cat Swamp, Providence, *J. F. Collins*, July 2, 1893. Connecticut: Southington, *L. Andrews*, no. 634; wet meadow, Columbia, Tolland County, *C. A. Weatherby*, no. 4088 (N. E.). New York: Stony Creek Ponds, Adirondack Mountains, *W. W. Rowlee, K. M. Wiegand, & G. T. Hastings*, July 10, 1899; shore of Oneida Lake, South Bay, Madison County, *H. D. House*, June 14, 1918; summit marsh, Spencer, Tioga County, *F. P. Metcalf*, no. 5674; Fisher's

Island, Suffolk County, *Harold St. John*, no. 2556. PENNSYLVANIA: along wet ditch, Quakertown, Bucks County, *W. M. Benner*, June 17, 1922. DELAWARE: Newcastle, *Edward Tatnall*. ONTARIO: Sharbot Lake, *J. Fowler*, July 16, 1898; Plevna, *J. Fowler*, July 26, 1902. MICHIGAN: sandy shore of Douglas Lake, Cheboygan County, *J. H. Ehlers*, no. 538; Isle Royale, *W. S. Cooper*, no. 169. OHIO: swamp at Cedar Point Hotel, Sandusky, *E. L. Morris*, no. a.67. INDIANA: slough, Millers, *O. E. Lansing, Jr.*, no. 2729. WISCONSIN: Point Sable, Green Bay, *J. H. Schuette*, July 19, 1883. ILLINOIS: in a drained tamarack swamp, Lake Villa, *H. A. Gleason & F. D. Shobe*, no. 116. MINNESOTA: Star Island, Cass Lake, *L. H. Pammel, H. E. Pammel & P. S. McNutt*, no. 824. IOWA: Ames, *C. R. Ball*, no. 133; Spirit Lake, *L. H. Pammel*, no. 555. MISSOURI: Buckner, *B. F. Bush*, no. 6763. SOUTH DAKOTA: Hill City, *David Griffiths*, no. 740. NEBRASKA: Scotia, *J. M. Bates*, June 22, 1908. MONTANA: Big Fork, Flathead Lake, *Mrs. Joseph Clemens*, July 22, 1908. IDAHO: near Britton, St. Joseph's River, *J. B. Leiberg*, no. 1299. WYOMING: Laramie River, Albany County, *Elias Nelson*, no. 442. COLORADO: Gunnison, *C. F. Baker*, no. 554. NEW MEXICO: Ponchuelo Creek, *P. C. Standley*, no. 4184. WASHINGTON: Big Meadows, Ione, *Frank O. Kreager*, no. 411. BRITISH COLUMBIA: above snowsheds, Glacier, *Stewardson Brown*, no. 630.

Typical *Calamagrostis canadensis*, common throughout the northern United States and southern Canada, is quite constant and distinct in the southern part of its range, but in northern New England, the Gulf of St. Lawrence region, and in the Rocky Mountains passes imperceptibly into the forms with larger spikelets, while in the Great Plains and the Mississippi Valley it grades equally imperceptibly into forms with smaller spikelets and blunter glumes. It seems best, therefore, to regard all of these forms as geographic varieties of a single species rather than to split species on characters which do not hold for a large percentage of intermediate forms.

Var. **Macouniana** (Vasey), n. comb. *Deyeuxia Macouniana* Vasey, Bot. Gaz. x. 297 (1885). *C. Macouniana* Vasey, Monogr. Grasses U. S., Contr. U. S. Nat. Herb. iii. 81 (1892).—Prince Edward Island and locally along the Atlantic Coast to New Jersey; and from Saskatchewan to Alberta and Montana, south to Missouri. Specimens examined: PRINCE EDWARD ISLAND: fresh or slightly brackish reclaimed marshes along Hillsborough River, Mt. Stewart, *M. L. Fernald et al.*, no. 6857. MASSACHUSETTS: swampy woods, Brewster, *M. L. Fernald and Bayard Long*, no. 17,936. CONNECTICUT: Hartford, *A. W. Driggs*, July 18, 1900. NEW JERSEY: Delanco, Burlington County, *Bayard Long*, August 10, 1909. MISSOURI: Lake City, *B. F. Bush*, no. 6839. NORTHWEST TERRITORY: borders of marshes, *J. Macoun*, 1883. NORTH DAKOTA: Leeds, Benson County, *J. Lunell*, July 13, 1902.

There seems to be no sharp difference between *Calamagrostis Macouniana* Vasey and *C. canadensis*. The spikelets are smaller in the former, and the glumes less acute, but forms with spikelets intermediate in both characters are common. The original material from Assiniboia, and the specimens from North Dakota and Missouri have narrow leaves and short, more contracted panicles, but these characters, are by no means constant, and the specimens from the Atlantic coast, while having the spikelets of *C. Macouniana*, have broad leaves and longer panicles, although the panicle is still more densely flowered than in typical *C. canadensis*. O. L. Inman (Rhodora, xxiv. 143) states, in addition to these characters, that the palea and lemma are subequal in *C. Macouniana*, but the writer has found the same range of proportions between the lengths of the two as in typical *C. canadensis*, and the original description of *C. Macouniana* states that the palea is ⅓ shorter than the lemma. *C. Macouniana*, therefore, is not distinct enough from *C. canadensis* to be considered a separate species.

Var. robusta Vasey in Rothr. in Wheeler Rep. vi. 285 (1878). Var. *acuminata* Vasey in Rydberg & Shear, Bull. U. S. Dept. Agr. Div. Agrost. v. 26 (1897).—Labrador to Alaska, south to northern New England, New York, the mountains of North Carolina, Ontario, Isle Royale, Michigan, and in the mountains to New Mexico, and California. Also northern Asia. The following are typical: Labrador: Kikkertasoak Island, Saglek Bay, *R. H. Woodworth*, no. 58; Hopedale, *J. D. Sornborger*, no. 242; boggy thickets, Forteau, *Bayard Long*, no. 27,487. Newfoundland: wet places along the railroad, Stephenville Crossing, *K. K. Mackenzie & Ludlow Griscom*, no. 10,072; on hill south of St. John's, *M. L. Fernald & K. M. Wiegand*, no. 4570. Quebec: sur les dunes au nord de l'estuaire, Natashquan, *Victorin & Rolland*, no. 18,204; subalpine meadows, 900–1100 m., western slope of Mt. Logan, Matane County, *M. L. Fernald & L. B. Smith*, no. 25,479; Little Metis, *J. Fowler*, July 25, 1906; meadows and swamps southeast of Bic, Rimouski County, *M. L. Fernald & J. F. Collins*, no. 877; alluvium, River Ste. Anne-des-Monts, *J. F. Collins & M. L. Fernald*, August 3–17, 1915; Lac Tremblant, Terrebonne County, *J. R. Churchill*, July 19, 1922; bois humides, Rivière Natiskotek, Anticosti Island, *Victorin & Rolland*, no. 27,837; basin, Ile du Havre-au-Ber, Magdalen Islands, *Victorin & Rolland*, no. 9030. Nova Scotia: summit of Bird Island, Cape Breton, *George E. Nichols*, no. 590; Canso, *J. Fowler*, August 10, 1901, Maine: Allagash River at Two Brooks, Aroostook County, *Emile F. Williams*, July 28, 1900; Slide, west wall of North Basin, Mt. Katahdin, *M. L. Fernald*, July 13, 1900. New Hampshire: Mt. Willard, *E. & C. E. Faxon*, July 20, 1875; Tuckerman's Ravine, Mt. Washington, *G. G. Kennedy*, July 11, 1895; summit of Mt. Moosilauke, *E. F. Williams*, August 3, 1908.

Vermont: Mt. Mansfield, *W. W. Eggleston*, no. 2475. North Carolina: Roan Mt., *F. L. Scribner*, July, 1889. Hudson Bay: Churchill, lat. 58° 50′, *J. M. Macoun*, no. 79,125. Alberta: near Edmonton, *John Macoun*, August, 1872; Devil's Head Lake, Banff, *J. Macoun*, August 3, 1891. Montana: Swan Lake, *Mrs. Joseph Clemens*, August 25, 1908. Idaho: Trinity Lake Region, Elmore County, *J. F. Macbride*, no. 707. Wyoming: Doyle Creek, Big Horn County, *L. N. Goodding*, no. 393; Johnson's Ranch, *Aven Nelson*, no. 3905. Colorado: Anita Peak, Routt County, *L. N. Goodding*, no. 1752; near Pagosa Peak, *C. F. Baker*, August, 1899; Twin Lakes, *John Wolfe*, no. 1093, 1873 (type, in U. S. National Herbarium). New Mexico: Winsor Creek, Pecos River National Forest, *P. C. Standley*, no. 4748. California: Angora Peak, Tahoe, 8000 feet, *F. J. Smiley*, no. 312. Oregon: Gibbon, Blue Mts., *Wm. C. Cusick*, no. 3611; wet places near stream, 3 miles above Wallowa Lake, *C. L. Shear*, no. 1797. Washington: gravelly soil, Cheelum Creek, Kittitas County, *J. S. Cotton*, no. 832; Cascade Mts., *Sandberg & Leiberg*, no. 795. British Columbia: Moose Lake, *N. Hollister*, no. 20; Kicking Horse Valley, vicinity of Field, *Stewardson Brown*, no. 498; near railroad, Rogers Pass, 4400 feet, *H. Peterson*, no. 468. Alaska: St. Michaels, *L. M. Turner*, no. 94,258.

This variety is quite distinct from typical *Calamagrostis canadensis* and replaces it to a large extent in Newfoundland, the Gulf of St. Lawrence region, and in the Rocky Mountains. It grades, however, imperceptibly into the typical form on the one hand, and to var. *Langsdorfi* on the other.

Specimens from Eastern Asia (Huigan, Manchuria, *Dorsett & Dorsett*, no. 3740; Heosomui and Aemuro, Yezo, Japan, *K. Miyabe*) are identical with North American forms of this variety, and it is probably general throughout north temperate Eastern Asia.

Var. Langsdorfi (Link). Inman, Rhodora xxiv. 143 (1922). *Arundo Langsdorfi* Link, Enum. Pl. Hort. Berol. i. 74 (1821). *C. Langsdorfii* Trin. Gram. Unifl. 225, t. 4, fig. 10 (1824). *C. scabra* Presl, Rel. Haenk. i. 234 (1828). *Deyeuxia Langsdorfii* Kunth, Rev. Gram. i. 77 (1829). *C. hirtigluma* Steud. Syn. Pl. Gram. 188 (1855)? *C. oregonensis* Buckl. Proc. Acad. Phil. 1862, 92 (1863) in part, acc. to Gray, ibid. 334 (1863). *C. columbiensis* Nutt., Gray l. c. *C. alaskana* Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 32 (1898). *C. Trinii* Almq. & Lehb, Svensk. Bot. Tidsskr. v. 374 (1916). —Of circumpolar distribution, in North America extending south to eastern Quebec, the mountains of New England, North Carolina?, Isle Royale, Michigan, and in the mountains to Colorado and California. Although Kearney recorded this variety from Roan Mountain, North Carolina, all specimens from there, seen by the writer, have been var. *robusta* Vasey. The following are typical: Greenland:

ca. Neria, 61° 33′ lat. bor. *J. Eugenius*, July 19, 1924; Quagssiarssuk, Igaliko-Fjord, 60° 53′ N. lat., *A. E. Porsild & M. P. Porsild*, August 5, 1925. Labrador: on granitic rock, river delta at head of Nachvak Bay, *R. H. Woodworth*, no. 60; Eclipse Harbor, *H. S. Forbes*, no. 11. Newfoundland: rocky meadows and brook bottoms, upper Deer Pond Brook, Highlands of St. John, *M. L. Fernald & Bayard Long*, no. 27,488; dry meadow, Bay St. George, *C. D. Howe & W. F. Lang*, no. 1014. Quebec: Blanc Sablon, *Ludlow Griscom*, no. 11; vielle prairie, Pointe-aux-Esquimaux, *Victorin & Rolland*, no. 18,209; rocky shore, Bonaventure Island, *Fernald & Collins*, no. 884; à la limite des arbres, sur les schistes hornblendiques, alt. 1300 m., Mt. Albert, *Victorin & Rolland*, no. 17,799. New Hampshire: five-mile post, Mt. Washington, *E. & C. E. Faxon*, July 9, 1895; Mt. Willey, *Faxon*, August 25, 1877; Echo Lake, Mt. Lafayette, *E. & C. E. Faxon*, September 14, 1890. Vermont: Smuggler's Notch, *E. & C. E. Faxon*, August 10, 1877. Ontario: near Silver Islet, *Henry Elman*, no. 64. Michigan: Isle Royale, Lake Superior, *T. C. Porter*, August 2, 1865. Colorado: wet grounds, 8000–10,000 ft. alt., Golden City, *E. L. Greene*, no. 437. California: wet places, Yosemite Valley, *H. N. Bolander*, no. 6088. Oregon: marsh, Pamalia Lake, foot of Mt. Jefferson, *Nelson*, no. 2784. Washington: base of Totoish Mountains, alt. 5000 ft., *O. D. Allen*, no. 176. British Columbia: Huchayak, *McKay*, 1882; Nootka, Vancouver Island, *Scouler*. Yukon Territory: Lake Kluane to Don Jek River, *A. Müller*, August 11–27, 1920. Alaska: False Pass, Unimak Island, *O. J. Murie*, August 7, 1925; Atkha Island, *L. M. Turner*, no. 1188; Ankon River, Yakutat Bay, *Funston*, no. 131; LeConte Bay, *Walker*, no. 873; St. Paul Island, Bering Sea, *Macoun*, no. 94,257.

Var. *Langsdorfi* in the arctic regions is very distinct from typical *Calamagrostis canadensis*, but there are so many intermediates between it and var. *robusta* where their ranges overlap, that it seems inadvisable to maintain it as a species. It is, however, as Dr. Eric Hultén suggested (Flora Kamtchatka, i. 103 (1927)), the central "link in the chain of closely allied forms together constituting a circumpolar type," and it is probable that the more southern forms have been evolved from it. Whether, as he further suggests, *C. villosa* Mutel and *C. purpurea* Trin., both of Eurasia, are merely varietal offshoots from this type, the writer has not seen enough critical material to judge. Certainly the European specimens of *C. villosa* seem very distinct from any American form, in their very narrow, long-acuminate glumes, long callus-hairs, and leaves long-pilose on the upper surface. If *C. villosa* and *C. Langsdorfi* were varieties of the same species, the whole set of forms, including *C. canadensis* and varieties, would have to be treated as varieties of *C. villosa*, that being the earliest name. How-

ever, in the opinion of the writer, this is not the case. He has not seen any authentic material of *C. purpurea* from Eastern Asia, where it was originally collected, but Scandinavian material (which Dr. Hultén suggests may be a hybrid) seems quite distinct from *C. Langsdorfi*. However, the final decision on these points will have to be left to European systematists.

Calamagrostis lactea Beal, Grasses N. A. ii. 346 (1896) (*C. Langsdorfi* var. *lactea* Kearney) is a peculiar form with the expanded panicle, the thin, hyaline lemma, and the short palea of this variety, but with the callus-hairs only two-thirds the length of the lemma, and the awn geniculate and twisted at the base. It is probably a hybrid between *C. canadensis* var. *Langsdorfi* and *C. nutkaensis* Presl.

Var. **arcta**, n. var., culmis erectis 4–6 dm. altis; foliis caulinis brevibus 7–12 cm. longis involutis scabris, ligulis suis 1.5–2.5 mm. longis; panicula 10–15 cm. longa contracta longissimis ramis suis 4–5 cm. longis; glumis in carina scabris, alibi minute pubescentibus vel glabris; lemmate 3.6–4.2 cm. longo, arista vix infra medium inserta recta, pilis lemma aequantibus vel excedentibus, nonnumquam paulo brevioribus; palea 2.8–3 mm. longa; processu 0.7–0.8 mm. longo barbato; antheris 1.4 mm. longis.

Culms erect, 4–6 dm. tall: cauline leaves short, 7–12 cm. long, involute, scabrous; their ligules 1.5–2.5 mm. long: spikelets 4–5 mm. long: glumes scabrous on the keel, elsewhere minutely pubescent or glabrous: lemma 3.6–4.2 mm. long: awn inserted just below the middle, straight: callus-hairs equalling or exceeding the lemma, sometimes a little shorter: palea 2.8–3 mm. long: prolongation of the rhachilla 0.7–0.8 mm. long, bearded: anthers 1.4 mm. long.—Greenland and Labrador. TYPE specimen in Gray Herbarium, collected on granitic cliffs at 150–600 m. at the Head of Nachvak Bay, Torngat Region, Labrador, *R. H. Woodworth*, no. 62, distributed as *C. hyperborea* Lange. Specimens examined: GREENLAND: Arfersiorfik Fjord, west Greenland, lat. 67° 53′ N., long. 50° W., *Porsild*, July 7, 1924. LABRADOR: Nachvak Bay, *Woodworth*, no. 62; north arm of Saglek Bay, *Woodworth*, no. 63 (as *C. hyperborea*).

A very distinct variety, resembling *Calamagrostis inexpansa* in its narrow, contracted panicle, and *C. neglecta* in its short ligules, but with the spikelets of *C. canadensis* var. *Langsdorfi*. The Greenland specimen differs in its shorter callus-hairs. It may be identical with *C. lapponica* var. *groenlandica* Lange (Consp. Fl. Groen. ii. 296 [1897]), but *C. lapponica* differs in its thicker, opaque lemma and curved or slightly geniculate awn.

Var. **pallida** (Vasey & Scribn.), n. comb. *Calamagrostis pallida* Vasey, Monogr. Grasses U. S., Contr. U. S. Nat. Herb. iii. 79 (1892).

C. blanda Beal, Grasses N. Am. ii. 349 (1896).—Wyoming and Montana to Washington, north to Alaska. Specimens examined: Wyoming: Yellowstone Park, *C. C. Parry*, no. 300; Lewis River to West Thumb, Yellowstone Park, *E. D. Merrill*, no. 151. Washington: along streams, Blue Mts., Columbia County, *Robert M. Horner*, no. R495B536; Washington Territory, *W. N. Suksdorf*, 1884. Alaska: Lake Iliamna Region, *M. W. Gorman*, no. 220.

Since the name *pallida* was used before Vasey & Scribner only by C. Mueller (Walp. Ann. vi. 986) for a variety or subspecies of *C. Halleriana* DC., it seems best to retain it for this American form.

While appearing quite distinct from *Calamagrostis canadensis*, *C. pallida* is separated by no reliable characters. Shade forms of *C. canadensis* exactly simulate *C. pallida* in shape and texture of glumes, while the flexuousness of the panicle-branches, a character used by Kearney to separate the two species, is very variable in both forms. The only definite character separating the two is the position of the insertion of the awn, and since aberrant forms with all the characters of *C. canadensis* but with the awn inserted near the tip of the lemma have been found (Alexis, Ohio, *H. A. Young*, June 28, 1885) it has seemed best to relegate *C. pallida* to a variety of *C. canadensis*.

2. C. Scribneri Beal, Grasses N. Am. ii. 343 (1896). *Deyeuxia dubia* Scribn. Bot. Gaz. xi. 174 (1886), not *Calamagrostis dubia* Bunge, Lehm. Rel. 348 (1847). *C. dubia* Scribn. in Vasey, Monogr. Grasses U. S., Contr. U. S. Nat. Herb. iii. 80 (1892). *C. canadensis dubia* Vasey l. c. *C. Langsdorfi* var. *Scribneri* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912).—Montana and Colorado to Oregon and Washington. Specimens examined: Wyoming: Slough Creek, Yellowstone Park, *Frank Tweedy*, no. 385. (type in U. S. National Herbarium). Idaho: Collins, *C. V. Piper*, no. 2815. Colorado: near Pagosa Peak, alt. 10,000 ft., *Th. Holm*, August 20, 1896. Oregon: granitic subalpine meadows, Wallowa Mts., 1660 m. alt., *Cusick*, no. 3120.

Quite distinct from all varieties of *Calamagrostis canadensis* in its bearded sheaths, short callus-hairs and longer palea. Specimens from eastern Quebec referred to this species are all forms with narrow panicles of *C. canadensis*.

Var. **imberbis**, n. nom. *C. anomala* Suksd. in Allg. Bot. Zeit. xii. 43 (1906), not Steud. in Lechl. Berb. Am. Aust. 56 (1857). Sheaths glabrous at the summit: palea shorter, ⅔ as long as the lemma, sometimes with a weak awn at the tip: otherwise as in the preceding.—Alberta and Wyoming to Washington. Specimens examined: Alberta: Kicking Horse Lake, *Macoun*, August 16, 1890. Wyoming: Woods Creek, *Nelson*, no. 3954. Washington: dry, loose soil, Chiquash Mts., *Suksdorf*, no. 2824 (type of *C. anomala* Suksd.).

Approaching *Calamagrostis canadensis* var. *robusta*, but differing in its narrower panicle with erect branches, short, unequal callus-hairs, and acutely toothed lemma.

3. C. CINNOIDES (Muhl.) Bart. Fl. Phila. i. 45 (1818). *Agrostis glauca* Muhl. Descr. Gram. 76 (1817), not *Arundo glauca* Bieb. *Arundo cinnoides* Muhl. Descr. Gram. 187 (1817). *C. canadensis* Nutt. Gen. i. 46 (1818) as to description, not *Arundo canadensis* Michx. *Arundo stricta* Spreng. Neu. Entdeck. i. 247 (1820) not Timm. *Phalaris arundinacea* Spreng. l. c. *P. americana* Spreng. l. c. *C. Langsdorfii Marylandica* Trin. Gram. Unifl. 225 (1824). *C. glauca* Trin. ibid. 228. *Arundo coarctata* Torr. Fl. U. S. 94 (1824). *A. canadensis* Nutt., Steud. Nom. ed. 1, 144 (1840). *C. Nuttalliana* Steud. ibid. 251. *C. coarctata* Torr. in Gray, Gram. et Cyp. i. no. 19 (1834). *Deyeuxia Nuttalliana* Vasey, Descr. Cat. Grasses U. S. 51 (1885).—Nova Scotia and Maine to Ohio, south to Georgia and Alabama. The following are typical: NOVA SCOTIA: Halifax, *J. R. Lunt*, July 18, 1912. MAINE: South Berwick, *J. C. Parlin*, September 12, 1896. NEW HAMPSHIRE: Hampton Beach, *A. A. Eaton*. MASSACHUSETTS: Purgatory, Dedham, *C. E. Faxon;* Barnstable, *J. M. Greenman*, no. 374. CONNECTICUT: Portland, Middlesex County, *Frances Wilson*, no. 70; Southington, *C. H. Bissell*, no. 743. NEW YORK: north side, Staten Island, *A. Gershoy*, no. 767. NEW JERSEY: Egg Harbor, *C. H. Bissell*, September 11, 1915; Lindenwold, Camden County, *J. M. Fogg, Jr.*, no. 608. PENNSYLVANIA: Red Rock Barren, Bushkill, Pike County, *E. B. Bartram*, August 3, 1918. DELAWARE: Pencader, *Edward Tatnall*. MARYLAND: near Clinton, *Th. Holm*, August 30, 1921. DISTRICT OF COLUMBIA: Tacoma, *T. H. Kearney, Jr.*, August, 1895. SOUTH CAROLINA: Caesar's Head, *J. D. Smith*, August, 1881. GEORGIA: Woodbury, Meriwether County, *R. M. Harper*, no. 1256.

4. C. SCOPULORUM M. E. Jones, Proc. Calif. Acad. Sci. ser. 2, v. 722 (1895). *C. scopulorum* var. *lucidula* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 33 (1898).—Utah. Specimens examined: UTAH: Altah, *M. E. Jones*, no. 1145 (TYPE of *C. scopulorum* var. *lucidula* Kearney); Armstrong and White Canyons, *Rydberg & Garrett*, no. 9512 (U. S.).

Var. **Bakeri**, n. var., arista inter dentes lemmatis inserta.

Awn inserted between the teeth of the lemma.—Near Pagosa Peak, at 9,000 feet, southern COLORADO, *C. F. Baker*, no. 162, August, 1899 (TYPE, in Gray Herbarium).

5. C. LUCIDA Scribn. Circ. U. S. Dept. Agric. Div. Agrost. xxx. 8 (1901). *Deyeuxia neglecta* var. *gracilis* Scribn. Bot. Gaz. lx. 175 (1886). *C. laxiflora* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 34 (1898), not Philippi, Anal. Univ. Chile (Pl. Nuev. Chilen.) xciv. 18 (1896).—Meadows, East Fork, YELLOWSTONE PARK, *Tweedy*, no. 582.

A peculiar form, known only from the type specimens. It has the short callus-hairs, opaque lemma, and glumes with the texture of those of *Calamagrostis neglecta*, but its foliage is rougher, the ligules longer, and the branches of the panicle more flexuous and less scabrous than in that species. It is probably a hybrid between *C. canadensis* and *C. neglecta*.

6. C. INEXPANSA A. Gray, Gram. et Cyp. i. no. 20 (1834). A very variable species. The following are well-marked varieties:

a. Spikelets 4–5.5 mm. long: lemma 3.5–4 mm. long: palea 2.7–3.2 mm. long.....*b.*
  b. Culms solitary: panicle 15–18 cm. long, loosely flowered; its longest branches 5–6 cm. long; its first internode 4 cm. long.....Var. *typica.*
  b. Culms mostly more or less caespitose: panicle 8–14 cm. long, densely flowered; the longest branches 2–4 cm. long; its first internode 1–2.5 mm. long.....Var. *robusta.*
a. Spikelets 3–4.5 mm. long: lemma 2.5–3.5 mm. long: palea 1.7–2.6 mm. long....*c.*
  c. Sheaths bearded at the summit: awn very short, inserted above the middle of the lemma or wanting.....Var. *barbulata.*
  c. Sheaths glabrous at the summit: awn present, inserted below the middle of the lemma....*d.*
    d. Panicle compactly flowered; its branches rigid, appressed, forked and spikelet-bearing nearly to the base: glumes thick and opaque, usually purple-tinged..Var. *brevior.*
    d. Panicle more loosely flowered; its branches erect or slightly spreading in anthesis, forked and spikelet-bearing from the middle or above: glumes thin except near the keel, green, rarely purple-tinged.....Var. *novae-angliae.*

Var. **typica.** *C. inexpansa* Gray, l. c.; Torr. Fl. N. Y. ii. 445, t. 152 (1843). *C. confinis* Gray, Man. ed. 2, 547 (1856), not Nutt. *C. neglecta* var. *inexpansa* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912).—Central New York and probably scattered locally throughout the Central States, and north to the Athabasca River. The writer has seen only the following: NEW YORK: Penn Yan, Yates County, *H. P. Sartwell,* 1833 (TYPE). ALBERTA: Athabasca Landing, *Hitchcock,* no. 11,429 (U. S.).

Typical *Calamagrostis inexpansa* is apparently a very local plant, differing from all other varieties in its elongate, loosely flowered panicle. It is probably a luxuriant southern extreme, found in good soil in sheltered places, of the more northern and generally distributed var. *robusta*. Forms of var. *brevior* approach it in length of panicle, but the panicle of that variety is always more densely flowered and the spikelets shorter.

Var. **robusta** (Vasey), n. comb. *C. stricta* var. *robusta* Vasey in Wheeler Rep. vi. 285 (1878). *C. hyperborea* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 39 (1898) in part, not Lange.—New-

foundland and eastern Quebec; the Rocky Mountains south to Colorado; and in the Coast Ranges from Oregon and Washington north to Alaska. The following are typical: NEWFOUNDLAND: calcareous rocks and talus, entrance to Port Saunders Harbor, Ingornachoix Bay, *Fernald & Wiegand*, no. 2555; in gravel, Southeast Arm, Bonne Bay, *Fernald & Wiegand*, no. 2561; serpentine gravel along Blomidon Brook, Bay of Islands, *Fernald & Wiegand* no. 2560; in limestone barrens, upper slopes, alt. 200–300 m., Table Mountain, Port à Port Bay, *Fernald & Wiegand*, no. 2558. QUEBEC: sur les gneiss laurentiens de la Pointe à la Marmite, Sept-Iles, *Victorin & Rolland*, no. 18,198; rivages calcaires, Ile à la Vache Marine, Mingan Islands, *Victorin & Rolland*, no. 20,522; dry talus of slaty cliffs, northern face of Mt. St. Pierre, at mouth of Riviere à Pierre, Gaspé County, *Fernald & Smith*, no. 25,480; border of Lac Chicoté, Table-topped Mountain, *Fernald*, no. 360; sur les cailloutis du plateau, Sand-Top, Anticosti, *Victorin & Rolland*, no. 27,835. ALBERTA: Cataract Creek, near Pinto Lake, *Stewardson Brown*, no. 1484 (as *C. Suksdorfi*). MONTANA: Swan Lake, *Griffiths & Lange*, no. 119 (as *C. montanensis*). COLORADO: Twin Lakes, *John Wolfe*, 1873 (TYPE in U. S. National Herbarium). OREGON: moist meadows, Union County, *W. C. Cusick*, 1879. WASHINGTON: low ground near Spangle, Spokane County, *Suksdorf*, no. 1100. BRITISH COLUMBIA: Vancouver Island, *Rosendahl & Brandegee*, no. 77 (U. S.); British Columbia, *H. L. Bolley*, 1889 (U. S.). ALASKA: Beardslee Island, Glacier Bay, *Anderson*, no. 1185 (U. S.); Yukon River, *Dawson*, no. 97 (U. S.); lake margin, Dutch Harbor, Unalaska, *E. C. Van Dyke*, no. 218.

There is no sharp specific line separating typical *Calamagrostis inexpansa* from the American forms identified by Dr. Kearney with *C. hyperborea* Lange, of Greenland. The stoloniferous habit is general throughout the genus, and whether the culms are solitary or caespitose depends chiefly on the type of soil in which they are growing. The panicle of typical *C. inexpansa* is longer and more loosely flowered, but many intermediates occur, particularly between the typical form and var. *brevior*. It seems wisest, therefore, to include all of these forms under *C. inexpansa*, except *C. hyperborea* of Greenland, which is specifically distinct.

Var. *robusta* is the most northern in distribution of these forms. It is the common form in Newfoundland, but is more local in Quebec, and is apparently much less common in the Rocky Mountains than the forms with smaller spikelets. It is very variable in stature, habit of growth, and in the shape and color of its glumes, but on the whole constitutes a well-marked trend.

Var. BARBULATA Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 37 (1898). Known only from the TYPE specimen: Mason County, WASHINGTON, *Piper*, no. 947.

Var. **brevior** (Vasey), n. comb. *Calamagrostis stricta* var. *brevior* Vasey in Wheeler Rep. vi. 285 (1878). *C. stricta* A. Gray, Proc. Am. Acad. vi. 79 (1866), not Timm. *Deyeuxia neglecta* var. *americana* Vasey in Macoun, Cat. Can. Pl. iv. 206 (1888). *D. neglecta* var. *robusta* Vasey l. c. *C. robusta* Vasey, Monog. Grasses U. S., Contr. U. S. Nat. Herb. iii. 82 (1892). *C. americana* Scribn. Bull. U. S. Dept. Agric. Div. Agrost. xi. 40 (1897). *C. hyperborea elongata* Kearney, ibid. xi. 40 (1898). *C. hyperborea stenodes* Kearney, ibid. 39, in part. *C. hyperborea americana* Kearney, ibid. 40. *C. elongata* Rydb. Rocky Mt. Fl. 58 (1917). *C. wyomingensis* Gandog. Bull. Soc. Bot. France, lxvi, sér. xix. 299 (1919).—Newfoundland and eastern Quebec to northern Vermont and central New York, west to British Columbia, south in the mountains to New Mexico, Arizona, and California. The following are typical: Newfoundland: Green Gardens, Cape St. George, *K. K. Mackenzie & Ludlow Griscom*, no. 11,117; springy places, north bank of river below the falls, Grand Falls, Exploits River, *Fernald & Wiegand*, no. 4583. Quebec: wet shelf at 400 feet, Grande Coupe, Percé, Gaspé County, *Collins, Fernald & Pease*, August 19, 1904; limestone-conglomerate cliffs and ledges, Cap au Massacre, Bic, *Collins & Fernald*, July 16, 1904; alluvions près de l'embouchure, Rivière a Jupiter, Anticosti Island, *Victorin & Rolland*, no. 24,377. New Hampshire: summit of Mt. Cannon, Franconia, *William Boott*, July 8, 1870. Vermont: base of Willoughby Cliff, *E. & C. E. Faxon*, July 26, 1886. New York: shore of Lowery's Pond, Junius, *K. M. Wiegand & R. Jones*, August 3, 1917. Ontario: Mungo Park Point, Nipigon Lake, *H. E. Pulling*, 1912. Indiana: railroad track, Clarke, *L. M. Umbach*, June 27, 1896. Michigan: sphagnum bog, Mud Lake, Cheboygan County, *J. H. Ehlers*, no. 563; Isle Royale, *W. S. Cooper*, no. 192. Wisconsin: University Bay, Madison, *J. R. Heddle*, no. 2T195. Minnesota: Iowa-Minnesota line, Elmore, *L. H. Pammel*, no. 915. North Dakota: Leeds, *J. Lunell*, no. 13. South Dakota: Brookings, *J. J. Thornber*, July 1, 1893. Nebraska: on Dismal River, south of Thedford, Thomas County, *P. A. Rydberg*, June 27, 1893. Saskatchewan: Regina, *J. Fowler*, July 27, 1903. Alberta: road and prairie, Craigmyle District, *A. H. Brinkman*, no. 727; near Jasper, *J. M. Macoun*, no. 98,159; damp ground, Castle Hill District, Rosedale, *M. E. Moodie*, no. 1131. Montana: wet meadow, Sheep Creek, *P. A. Rydberg*, no. 3309; Columbia Falls, *R. S. Williams*, September 25, 1893. Idaho: open soil near the river, St. Anthony, *E. D. Merrill & W. N. Wilcox*, no. 153. Wyoming: bars of Buffalo River at Government Bridge, Teton Forest Reserve, *Merrill & Wilcox*, no. 403; Sheridan, *Elias Nelson*, no. 301. Colorado: Gunnison, *C. F. Baker*, no. 579; Fort Garland, *Vasey*, 1884. Utah: springy places, Crossman Valley, east of Lookout Mountains, *H. Engelmann*, July 20, 1859. Nevada: West Humboldt Mountains, *S. Watson*, no. 1290. Arizona: Willow Spring, *E. Palmer*, no. 616. California: Nellie Lake, Fresno

County, *F. J. Smiley*, no. 611. OREGON: one mile southeast of Keno, Klamath County, *M. E. Peck*, no. 9402. WASHINGTON: Douglas County, *Sandberg & Leiberg*, no. 525. BRITISH COLUMBIA: summit of Selkirk Mountains, altitude 4500 feet, *John Macoun*, August 2, 1890.

This is the common form throughout the Great Plains and the Cordilleran Region. It is very variable in the length and compactness of its panicle, the shape of its glumes, and in the general habit of its leaves and culms, but no definite segregates can be made. Dr. Kearney separated forms with elongate panicles and more acuminate glumes as *Calamagrostis hyperborea elongata*, but the type specimen which he cites (Dismal River, Plummer County, Nebraska, *Rydberg*, no. 1494) is hardly separable from the typical form of var. *brevior*, and the differences on which the variety is based are very inconstant, particularly the shape of the glumes, which appears to change as the spikelet matures.

A form from Bic, Quebec (*Fernald & Collins*, no. 880), has the spikelets of this variety, but the smooth foliage and short ligules of *Calamagrostis neglecta*. It may be a hybrid between these two.

Calamagrostis hyperborea stenodes Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 39, is an aggregate of forms with short, densely flowered panicles, some of which may be referred to this variety, and some may be hybrids between it and *C. neglecta*. The type specimen is clearly *C. neglecta*.

Var. **novae-angliae**, n. var., culmis solitariis erectis 11–15 dm. altis; foliis caulinis planis scabris ligulis suis 4–7 mm. longis; panicula 12–16 cm. longa angusta, ramis erectis vel ad anthesin paulo patentibus, longioribus 2–5 cm. longis, infra rectis vel paulo flexuosis, ramosis et spiculas ferentibus ad vel supra medium; spiculis 3.5–4 mm. longis; glumis acuminatis valde carinatis scabris ad apicem pallidis fuscescentibus, alibi viridibus albescentibus et translucentibus: lemmate paleaque precedenti similibus.

Culms solitary, erect, 11–15 dm. tall: cauline leaves flat, scabrous, their ligules 4–7 mm. long: panicle 12–16 cm. long, narrow; its branches erect, or somewhat spreading in anthesis; the longer 2–5 cm. long, straight below or somewhat flexuous, branched and spikelet-bearing from the middle or above: spikelets 3.5–4 mm. long: glumes acuminate, strongly keeled, scabrous, chartaceous at the tip, elsewhere pale green and faintly translucent: lemma and palea as in the preceding.—Damp woods and wet, shaded cliffs, northern New England. Specimens examined: MAINE: woods, trail from Northeast Harbor to Jordan Pond, Mt. Desert Island, *E. F. Williams & E. L. Rand*, July 19, 1899 (TYPE in Gray Herb.); Jordan Mt., Mt. Desert Island, *E. L. Rand*, July 19, 1897 (N. E.). NEW HAMPSHIRE: Crawford

Notch, Hart's Location, *A. S. Pease*, no. 16,749 (N. E.). Vermont: high ledges, Willoughby Mt., Willoughby, *Walter Deane*, July 19, 1885.

A form preferring shady, sheltered places, apparently not calcicolous as are the other varieties of this species, and possibly more abundant in New England and the adjacent territory. The Mt. Desert material, collected in several different localities on the Island, is almost identical with that from Crawford Notch, and forms with it a well-marked variety with almost enough characters to make it a distinct species, but the specimens from Willoughby, growing together with var. *brevior*, show transitions to that variety. The glumes are considerably thinner than those of the other varieties of *Calamagrostis inexpansa*, and somewhat resemble those of *C. neglecta*, but they are paler, greener, and more scabrous, while the broad, scabrous leaves and long ligules distinguish it immediately from that species.

7. C. crassiglumis Thurb. in S. Wats. Bot. Calif. ii. 281 (1880). *Deyeuxia crassiglumis* Vasey, Descr. Cat. Grasses U. S. 50 (1885). *C. neglecta* var. *crassiglumis* Beal, Grasses N. Am. ii. 353 (1896).—Northern California to Alaska, near the coast. Specimens examined: California: swamps, Mendocino County, *Bolander*, no. 4766 (type). Washington: Whatcom Lake, Whatcom County, *Suksdorf*, no. 1024. British Columbia: pebbly beaches, Cowichan Lake, Vancouver Island, *C. O. Rosendahl*, no. 1866; sandy shores, Lake Karmutzen, Vancouver Island, *Dawson*, August 6, 1885. Alaska: Amaknak Island, Unalascha, *M. W. Harrington*, October 20, 1871; without definite locality, *A. Kellogg*, no. 154.

A very well marked species. A form from Humboldt County, California, (*Kellogg & Harford*, no. 1090) has the thick glumes of this species, but has much larger spikelets, 6 mm. long, long ligules, and rough foliage, while the anthers are 2.6 mm. long, larger than in any species of this subsection. It may be a hybrid between *Calamagrostis crassiglumis* and *C. nutkaensis* Presl.

8. C. hyberborea Lange, Fl. Dan. xvii. 50, t. 2942 (1880); Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 39 (1898), in part. *C. neglecta* var. *hyperborea* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912), in part.—Greenland. Specimens examined: Neria, 61° 33′ lat. bor., *J. Eugenius*, July 30, 1924, and July 30, 1925; Holsteinborg, *Th. M. Fries*, August 1, 1871.

Distinguished from all varieties of *Calamagrostis inexpansa* by its leaves, smooth on the lower, scabrous only on the tip and the upper surface; short ligules; and very narrow, acuminate glumes which are frequently hyaline on the tip and the margins. The original descrip-

tion says "foliis planis, scabris," but it is probable that this referred to the upper surface only.

9. C. LABRADORICA Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 38 (1898).—Southern Labrador, south along the northern shore of the Gulf of St. Lawrence to Anticosti Island. Specimens examined: QUEBEC: Bonne Espérance, *J. A. Allen*, no. 18 (TYPE U. S.); Bradore, Saguenay County, *Fernald & Wiegand*, no. 2551; Vielle Romaine, Archipel Ouapitagone, *H. St. John*, no. 90,125 (distributed as *C. hyperborea*); Ilêts de la Baie à Jean, *Victorin & Rolland*, no. 18,197; Natashquan, *Fernald & Long*, no. 27,496 (as *C. neglecta* var. *borealis*); sur les gneiss laurentiens du rivage, Magpie, *Victorin & Rolland*, nos. 18,242 and 18,541 (as *C. neglecta* var. *borealis*); Pointe Sud-Ouest, Anticosti, *Victorin & Rolland*, nos. 24,383 and 27,482 (as *C. neglecta*). The specimen from Fox Harbor, Labrador, (*J. A. Allen*, 1882) cited by Kearney has not been seen by the writer.

Intermediate between *Calamagrostis inexpansa* var. *robusta* and *C. neglecta*. It has in general the spikelet-characters of the former, but the glumes are more lustrous and less scabrous. The habit, foliage, and ligules resemble *C. neglecta*. The type specimen, and others from the northern part of the range of the species have a much interrupted panicle with very short branches, but forms from farther south with the same habit and spikelet-characters have a more compact, somewhat shorter panicle.

11. C. NEGLECTA (Ehrh.) Gaertn., Meyer & Scherb. Fl. Wetterau, 94 (1799). Very variable. The following are sufficiently marked to be classed as varieties.

a. Spikelets 3–5 mm. long: glumes sharply acute or acuminate . . . . . *b.*
  b. Culms 3–10 dm. high: panicle 5–15 cm. long: callus-hairs ½–¾ the length of the lemma: awn inserted ¼–⅓ of the way up the lemma . . . . . *C. neglecta* (typical).
  b. Culms 1–4 dm. high: panicle 2–5 cm. long: callus-hairs ¼–½ the length of the lemma: awn inserted ⅓–½ the way up the lemma . . . . . Var. *borealis*.
a. Spikelets 2–2.6 mm. long: glumes obtuse or merely acute . . . Var. *micrantha*.

C. NEGLECTA (Ehrh.) Gaertn., Meyer & Scherb. l. c., as to name-bringing synonymy. *Arundo neglecta* Ehrh. Beitr. vi. 84, 137 (1791). *A. stricta* Timm. in Siemss. Meckl. Mag. ii. 235; ex Schrad. Fl. Germ. 215 (1806). *C. stricta* Koel. Descr. Gram. 105 (1802). *Deyeuxia neglecta* Kunth, Rev. Gram. i. 76 (1835). *C. coarctata* Hook. Fl. Bor.-Am. ii. 240 (1839). *C. lapponica* A. Gray, Proc. Am. Acad. vi. 78 (1866) in part. *Deyeuxia neglecta brevifolia* Vasey in Macoun, Cat. Can. Pl. iv. 206 (1888). *C. neglecta Wrightii* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 36 (1898). *C. californica* Kearney, ibid. 37. *C. hyperborea stenodes* Kearney, ibid. 29, in part.—Northern Eurasia, and in America from Greenland and Labrador to Alaska, south to

Nova Scotia, New Brunswick, northern Maine, Wisconsin, Colorado and California. The following are typical: Greenland: Quagssiarssuk, Igaliko-Fjord, 60° 53′ N., *A. E. Porsild & M. P. Porsild*, August 5, 1925 (as *C. hyperborea* Lange). Labrador: on sandy bank of White Bear River, Sandwich Bay, *R. H. Woodworth*, no. 61. Newfoundland: gravelly and turfy strand near Isthmus Cove, Pistolet Bay, *Wiegand, Gilbert & Hotchkiss*, no. 27,491; boggy barren south of Ship Cove, Sacred Bay, *Fernald, Wiegand & Long*, no. 27,492. Quebec: swales along Blanc Sablon River, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 27,495; tourbière humide, Ile à la Chasse, Mingan Islands, *Victorin & Rolland*, no. 24,381; sur les platieres, Rivière York, Gaspé County, *Victorin et al.*, no. 17,802; margin of cold brook, mouth of Bonaventure River, Bonaventure County, *Williams & Fernald*, July 31, 1902; dans la grande prairie saumâtre, Lac Salé, Anticosti, *Victorin & Rolland*, no. 27,840; bogs and ponds between East Cape and East Point, Coffin Island, Magdalen Islands, *Fernald et al.*, no. 6860. Prince Edward Island: brackish marsh, Green's Shore, Summerside, *Fernald & St. John*, no. 6858. New Brunswick: wet, marshy land, Shediac Cape, *F. T. Hubbard*, no. 705; river gravels, St. John River, Woodstock, Carleton County, *Fernald & Long*, no. 12,635. Nova Scotia: springy swales south of Amherst, Cumberland County, *Fernald*, no. 19,430. Maine: strand of Aroostook River, Fort Fairfield, Aroostook County, *R. W. Woodward & C. H. Bissell*, July 11, 1914. Wisconsin: Menekaunee, *J. H. Schuette*, June 26, 1892 Minnesota: Middle Lake, *C. A. Ballard*, June 1892. Saskatchewan: marshes near Boulder Lake, *John Macoun & Wm. Heriot*, no. 77,147 (U. S.). Alberta: swamp, Banff, *A. S. Hitchcock*, no. 11,476 (U. S.) (as *C. inexpansa*). Montana: borders of streams, *F. L. Scribner*, July, 1883 (U. S.). Idaho: Montpelier, *T. A. Williams*, no. 2521. Wyoming: Bull Camp, Crazy Woman's Creek, 7500–8000 ft., *T. A. Williams*, no. 2768 (as *C. hyperborea*); Black Rock Springs, Sweetwater County, *Aven Nelson*, no. 3717 (as *C. americana*). Colorado: Rocky Mountains, lat. 39°–41°, *Hall & Harbour*, no. 649. California: Sierra County, *J. G. Lemmon*, no. 444 (type of *C. californica* Kearney). Oregon: Big Meadow, Des Chutes River, *J. R. Leiberg*, no. 522. Washington: Marshall Junction, *C. V. Piper*, no. 2254. British Columbia: Terrace, Skiva River, *J. K. Henry*, no. 17 (U. S.). Yukon Territory: Bear Creek, near Lake Desert d'Asch, *Adolf Mueller*, August 6, 1920. Alaska: Glacier Bay, *Walker*, no. 826.

Variable in height, length and breadth of leaves, and size of panicle. It is sometimes too close to the varieties with small spikelets of *Calamagrostis inexpansa*, but can usually be distinguished by its leaves which are smooth on the lower surface, its short ligules, and its thinner, more translucent glumes, although intermediates occasionally occur in all these characters. The western forms have generally

rougher foliage, although agreeing with true *C. neglecta* in all other characteristics.

Var. BOREALIS (Laestad.) Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 35 (1898). *Arundo groenlandica* Schrank, Regensb. Denkschr. ii. 8 (1818). *C. groenlandica* Kunth, Rev. Gram. i. 79 (1829). *C. borealis* Laest. Bidr. Vaextl. Torn. Lappm. Ups. 44 (1860). *C. stricta* var. *borealis* Hartm. Skand. Flor. ed. 11, 517 (1879). *Deyeuxia vancouverensis*, Vasey, Bull. Torr. Club. xv. 48 (1888). *Deyeuxia borealis* Macoun, Cat. Can. Pl. iv. 207 (1888).—Arctic regions, south in North America to Labrador, Newfoundland and James Bay. The following are typical: GREENLAND: Atanikerdluk, lat. 70° 2′ *A. E. Porsild*, August 10, 1921; Millenfjordens Bund, *A. E. Porsild*, August 11, 1923; Disco, *M. P. Porsild*, August 16, 1902. LABRADOR: Bowdoin Harbor, *C. S. Sewall*, no. 133; Nain, *Sewall*, no. 96; Anatolak, *Sewall*, no. 429. NEWFOUNDLAND: Burnt Cape, Pistolet Bay, *Fernald & Long*, no. 27,490; Capstan Point, Flower Cove, Straits of Belle Isle, *Fernald, Long & Dunbar*, no. 26,270; Grand Lake, *Waghorne*, no. 61.

Except for its small size and short panicle, the characters separating this variety from the typical form are very unreliable, although it represents a sufficiently well-marked tendency to be separated as a variety. Schrank's *Arundo groenlandica* is undoubtedly the same, but it is not, as Steudel suggests, the same as Steudel's *Calamagrostis hirtigluma*, which he describes as a larger plant, with flat leaves, a panicle 3–4 inches (7–10 cm.) long, and which is very likely *C. canadensis* var. *Langsdorfi*, although his description is wholly inadequate.

Var. **micrantha** (Kearney), n. comb. *C. micrantha* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. xi. 36 (1898). *C. micrantha* var. *sierrae* M. E. Jones, Contrib. West. Bot. xiv. 9 (1912)?—Wisconsin and Saskatchewan locally west to California, north to Yukon Territory. Specimens examined: WISCONSIN: Madison, *T. J. Hale*, 1860. NORTH DAKOTA: Pleasant Lake, Pierce County, *J. Lunell*, no. 22. ALBERTA: Athabasca Landing, *Hitchcock*, no. 11,431 (U. S.). COLORADO: Steamboat Spa, *Shear & Bessey*, no. 1351. OREGON: Farwell Bend, Crook County, *J. B. Leiberg*, no. 463; Devil's Lake, *A. S. Hitchcock*, no. 23,490 (U. S.). YUKON TERRITORY: along Yukon River, Whitehorse, *Hitchcock*, no. 2943 (U. S.).

Calamagrostis micrantha Kearney does not seem specifically distinct from *C. neglecta*, as intermediates are found both in size and shape of the glumes and in the breadth of the panicle. The writer has not seen material of var. *sierrae* M. E. Jones, and it may be varietally distinct, although the characters given are not reliable ones. The specimen from Farwell Bend, Oregon (*J. B. Leiberg* 463) has longer panicle-

branches, and a very short or obsolete awn, and may correspond with this variety, but the writer does not feel justified in separating it without seeing more material.

C. neglecta var. *candidula* Kearney, Bull. U. S. Dept. Agr. Div. Agrost. xi. 35, with pale scabrous leaves, long ligules, pale glumes, a distinctly bent, though not twisted awn, and the lemma nearly equalling the palea, clearly does not belong to this species, and is probably an aberrant form of *C. montanensis* Scribn.

11. C. LAPPONICA (Wahlenb.) Hartm. Skand. Fl. ed. 1, 46 (1820). *Arundo lapponica* Wahlenb. Fl. Lapp. 27, t. i. (1812).—A species of northern Europe, represented with us by:

Var. **brevipilis**, n. var., a forma typica differt pilis brevioribus ⅔ longitudine lemmatis; innovationibus pluribus.

Callus-hairs short, ⅔ the length of the lemma: innovations numerous.—QUEBEC: abundant in sand or bogs on the gneiss plain, Blanc Sablon, Straits of Belle Isle, *M. L. Fernald & K. M. Wiegand*, no. 2547 (TYPE in Gray Herb.).

Calamagrostis lapponica is intermediate in its characters between all three of the divisions of the *Quinquinerviae*. The typical form has the long copious hairs of § *Calamagris*, while it has the thick lemma of § *Deyeuxia*, with the short palea of the subsection *Orthoatherae*, and a bent, slightly geniculate awn, approaching that of the subsection *Ancylatherae*, although the awn is not twisted at the base, as it is in the species of that subsection. Dr. Eric Hultén (Fl. Kamtchat. 107) implies that its pollen is sterile, which leads to the supposition that its intermediate characters may be due to hybridization. The American form, with its short, unequal callus-hairs, belongs clearly in § *Deyeuxia*.

The writer has not seen material of *Calamagrostis lapponica* var. *groenlandica* Lange, Consp. Fl. Groenl. ii. 296 (1887), described as differing from the European form in its short callus-hairs and straight awn, but it seems doubtful that with those characters it could be placed in this species. It may be an aberrant form of *C. neglecta* or *C. hyperborea*, or, as suggested above, *C. canadensis* var. *arcta*.

In concluding, the writer gratefully acknowledges the invaluable aid of Professor M. L. Fernald, under whose direction this work was carried out. He also expresses his gratitude to Professor A. S. Hitchcock, for his assistance in giving access to the specimens in the National Herbarium, to Dr. M. O. Malte, for his generous loan of a type-sheet, and to Miss Sanderson, librarian at the Gray Herbarium for her aid in securing obscure literature.

Explanation of Plate 195

Fig. 1, Calamagrostis canadensis, spikelet × 5, from Kennebunkport, Maine, *G. G. Kennedy*. Fig. 2, C. canadensis var. robusta, spikelet × 5, from Sand Bank, west of Burgeo, Newfoundland, *Fernald, Long, & Fogg*, no. 91. Fig. 3a, C. canadensis var. Langsdorfi, spikelet × 5, from Tunugliarfik-Fjord, Kiagtût, Greenland, *A. E. Porsild & M. P. Porsild;* fig. 3b, panicle × ½, fig. 3c, ligule × 2. Fig. 4, *C.* Scribneri, spikelet × 5, from near Pagosa Peak, Colorado, *C. F. Baker*, no. 160. Fig. 5a, C. canadensis var. arcta, panicle × ½, type specimen from head of Nachvak Bay, Labrador, *R. H. Woodworth*, no. 62; fig. 5b, ligule × 2. Fig. 6a, C. inexpansa var. brevior, panicle × ½, from base of cliffs, Mt. Willoughby, Vermont, *E. & C. E. Faxon;* fig. 6b, spikelet × 5. Fig. 7a, C. inexpansa var. novae-angliae, panicle × ½, type specimen from woods, Mt. Desert Island, Maine, *E. F. Williams & E. L. Rand;* fig. 7b, spikelet × 5; fig. 7c, ligule × 2. Fig. 8, C. hyperborea, spikelet × 5, from Neria, Greenland, *J. Eugenius*. Fig. 9, C. lapponica var. brevipilis, spikelet × 5, type specimen from Blanc Sablon, Quebec, *Fernald & Wiegand*, no. 2547. Fig. 10, C. labradorica, spikelet × 5, from Magpie, Quebec, *Victorin & Rolland*, no. 18,242. Fig. 11a, C. neglecta, spikelet × 5, from mouth of Bonaventure River, Quebec, *Williams & Fernald;* fig. 11b, ligule × 2.

(To be continued)

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. LXXXVII

(*Continued from p. 57.*)

IV. THE COMPLEX BROMUS CILIATUS

M. L. Fernald

(Plate 196)

Bromus **Dudleyi**, n. sp. (Tab. 196, figs. 1–3). Planta noncaespitosa vel plus minusve caespitosa 0.4–1.2 m. alta; culmis erectis glabris nodis sparse breviterque pilosis; foliis caulinis plerumque 6 late linearibus utrinque glabris vel paginis superioribus villosis, vaginis glabris vel rare villosis, laminis mediis 1–2.5 dm. longis 4–12 mm. latis; paniculis lanceolatis vel ovatis laxe ramosis 0.6–2 dm. longis, ramis filiformibus scabris remotis adscendentibus vel patentibus vix pendulis; spiculis lanceolato-oblongis vel anguste ellipticis 2–2.5 cm. longis 5–9 mm. latis 4–7-floris; glumis planiusculis vix conduplicatis submembranaceis, marginibus scariosis purpureo- vel aeneo-tinctis; gluma inferiore lanceolata acuta vel attenuata late costata, costa laevi vel scabra; gluma superiore oblongo-lanceolata obtusa vel subacuta plerumque breviter aristata valde lateque 3 (rarissime 5)-costata, costis brunneis vel purpurascentibus; lemmatibus planiusculis submembranaceis anguste oblongis aristis exceptis 1–1.2 cm. longis 2.3–3 mm. latis purpurascentibus aeneis vel rare virescentibus obtusis vel subacutis apice aristatis arista scabra 2–4 mm. longa, paginis dorsalibus 3–5-nervatis in parte extra nervos laterales valde villoso-hirsutis ad vel supra medium; palea plana oblonga quam lemma breviore, marginibus infra apicem plerumque scariosis 0.5–0.7 mm. latis integris, nervis ciliolatis infra a marginibus et a medio subaequidistantibus ad apicem versus marginalibus; antheris 1–2 mm. longis; caryopsibus oblongo-lanceolatis 8 mm. longis 1.6 mm. latis, latere ventrali valde costato.—Newfoundland to British Columbia, south to Nova Scotia, northern and western New England, New

York, Michigan, Minnesota and Montana. Newfoundland: bushy swale along Deer Brook, Bonne Bay, August 26, 1929, *Fernald, Long & Fogg*, no. 1223 (type in Gray Herb.); boggy thickets, Birchy Cove (Curling), *Fernald, Wiegand & Kittredge*, no. 2624 (in part); gravelly railroad embankment, Grand Falls, *Fernald, Wiegand & Darlington*, no. 4679; gravelly thickets along Harry's River, *Fernald & Wiegand*, no. 2617; wet runs and boggy spots in limestone barrens, Table Mountain, Port à Port Bay, *Fernald, Wiegand & Kittredge*, no. 2619. Quebec: wet thicket, Ile du Havre, Mingan, *St. John*, no. 90,166; alluvial thickets, Dartmouth River, August 26 & 27, 1904, *Collins, Fernald & Pease;* gravel of River Ste. Anne des Monts, August 3–17 1905, *Collins & Fernald;* alluvial islands at the mouth of Bonaventure River, August 4, 1904, *Collins, Fernald & Pease:* alluvial thickets and low wooded river-banks, Little Cascapedia River, July 29 & 30, 1904, *Collins, Fernald & Pease;* Kondiaronk, Lac Saint-Jean, *Victorin*, nos. 15,265, 15,266; Lac Noir, Co. Megantic, *Victorin*, no. 11,369. Prince Edward Island: damp thicket, Indian River, *Fernald, Long & St. John*, no. 6931. Nova Scotia: gravelly thicket, Uniacke Lake, *Fernald, Bartram & Long*, no. 23,335. Maine: dry field, outlet, Pleasant Pond, *Collins & Chamberlain;* moist soil, Beddington, September 2, 1924, *Knowlton;* wet place, Rockland, *C. A. E. Long*, no. 660; river-thickets, Sydney, *Fernald & Long*, no. 12,718. New Hampshire: boggy meadow, Clarkesville, *Fernald & Pease*, no. 17,050; moist woods, Glen Ellis, Pinkham Notch, July 23, 1921, *Knowlton;* damp woods, Melvin Village, August 23, 1904, *M. A. Day.* Vermont: damp place, Townshend, July 25, 1903, *Blanchard.* Massachusetts: edge of woods, Sherborn, *M. L. Loomis*, no. 1360; roadside, Princeton, August 9, 1894, *J. F. Collins;* Ashfield, August 3, 1909, *E. F. Williams* (type of *B. ciliatus*, forma *denudatus*); Heath, July 17, 1909, *E. F. Williams;* roadside thicket, Tolland, *F. C. Seymour*, no. 335; open bog, Lanesboro, August 4, 1920, *R. Hoffmann.* Connecticut: Hampton, August 11, 1888, *Chas. Wright* (with comment: "lower glume with faint lateral nerves"); dry bank, Lisbon, August 26, 1902, *C. B. Graves.* New York: open sedgy bog, Round Marshes, Cortland, *Eames & MacDaniels*, no. 159; boggy meadow near headwaters of Beaver Brook, Cortland, *F. P. Metcalf*, no. 5814 (distributed as *B. ciliatus*, var. "Very characteristic bog form"); open moor of Lowery's Pond, Junius, *Metcalf*, nos. 1727 and 5815 ("Swamp variety"); Ontario: Leamington, *J. Macoun*, no. 26,058. Michigan: swamps, Keweenaw Co., *Farwell*, no. 562a (with note: "hairs of glumes *spreading*, not *appressed*"). Minnesota: Muskoda, Red River Valley, *Ballard*, no. 3075. Saskatchewan: margins of lakes and streams, Moose Mountain Lake, August 5, 1883, *J. Macoun.* Montana: East Gallatin swamps, *Rydberg*, no. 3170. British Columbia: Mile 81, Pacific Great Eastern Ry., *J. M. Macoun*, no. 94,021.

Bromus Dudleyi has been confused with and usually distributed as

B. ciliatus L.; but *B. ciliatus*, the commonest species of thickets and borders of woods in eastern Canada and the northeastern States has, when well developed, a larger and greener panicle with more pendulous branches. Its well developed spikelets (FIGS. 4 and 5) are so open as plainly to show the slender rhachilla, while in *B. Dudleyi* the lemmas are so approximate that the short internodes of the rhachilla are difficult to see. *B. Dudleyi* matures early. Of the 60 sheets before me not one has young or freshly flowering spikelets; all are in fruit or so mature that the spikelets are disintegrating and nearly all were collected at dates ranging from July 17 through August, with only four (overripe) collections in the first half of September. *B. ciliatus*, on the other hand, as shown by a very extensive series, especially from Newfoundland and eastern Canada and New England, is rarely in anthesis before the middle of July, when *B. Dudleyi* is becoming mature. The large representation of *B. ciliatus* before me shows that in New England, eastern Canada and Newfoundland it is in flower (the spikelets not readily disintegrating) from mid-July into September, and that the fruiting material had been collected from August 11 through September.

In habitat *Bromus Dudleyi* shows a marked preference for (though not restriction to) limy or neutral bogs and wet thickets, being specially characteristic of the calcareous regions of Newfoundland, the Mingan Islands, the Gaspé Peninsula, western New England, central New York, etc. It is the plant which the late W. R. Dudley specially designated in his Cayuga Flora, as

> 1256. **B. ciliatus**, L. var. ——, approaching some of the Rocky Mt. forms (according to Dr. Vasey,) occurs in our sphagnum bogs or wet meadows. The plants are low, light-green; the panicle peculiarly chaffy in appearance, light-colored, and the flowering glumes smooth on the back but strongly ciliate. It is abundant, in Round Marshes, along Locke Pond and elsewhere.[1]

Its occurrence in the calcareous bogs of central New York was again emphasized by Wiegand, who mistook the bog-plant for *Bromus ciliatus:* "In central New York *B. ciliatus* is generally an inhabitant of marl springs and calcareous boggy places. In other portions of its range it does not seem to be confined to boggy places or even to calcareous situations, yet no structural difference is apparent between the New York material and that from elsewhere."[2] And later, Wiegand & Eames referred to this early-maturing plant of wet habitats as growing

[1] Dudley, Cayuga Fl. 129 (1886).
[2] Wiegand, RHODORA, xxiv. 91 (1922).

in the Cayuga Basin in "Boggy meadows and springy places, in marl or strongly calcareous soils; frequent. July–Aug."[1]

When he published *Bromus ciliatus*, forma *denudatus* Wiegand, Rhodora. xxiv. 91 (1922), Wiegand merely distinguished from *B. ciliatus* with sheaths villous the plants with sheaths glabrous and he separated off in the Gray Herbarium two covers full of such specimens (most of them with all the spikelet-characters of *B. ciliatus*), stating that the smooth-sheathed form occurs "Throughout the range of the typical form"; but he specially designated as the type a single specimen "Ashfield, Massachusetts, 1909, *E. F. Williams*." The type-specimen was an unfortunate selection, for it is an over-ripe specimen with the spikelets completely disintegrated. It was collected on August 3d and the fragments seem to indicate that the type of forma *denudatus* belongs to *B. Dudleyi*. Somewhat later, still not understanding the differences in the spikelets which separate *B. Dudleyi* and *B. ciliatus*, but conscious that glabrous-sheathed plants are more general in the North than are those with villous sheaths, I elevated the form to varietal rank as *B. ciliatus*, var. *denudatus* (Wiegand) Fernald, Rhodora, xxviii. 20 (1926). Since the conceptions back of *B. ciliatus*, forma *denudatus* and var. *denudatus* were mixed, since their technical type is a specimen with badly shattered panicle and since forms with villous or with glabrous (denudate) sheaths occur in our other species of the group (*B. ciliatus*, *B. Richardsoni*, *B. altissimus*, *B. purgans*, etc.) it would be unwise further to elevate the name. The International Rules of Nomenclature make no requirement that a name appropriate in one category shall necessarily be retained when the rank is changed, particularly if it is a *nomen confusum*. It seems right, therefore, to give this belated recognition to the acumen of the late William Russell Dudley, who nearly half a century ago clearly recognized the distinctness of the plant here proposed as *B. Dudleyi*, and to designate as a type a numbered specimen of unquestioned identity.

The specific distinctions between *Bromus Dudleyi* and *B. ciliatus* are briefly stated below:

B. ciliatus. Panicles (except in dwarf plants) 1–3 dm. long, with more or less nodding branches: spikelets green or greenish, rarely purple- or bronze-tinged, at maturity loose, displaying the rachilla: glumes strongly conduplicate; the 2d narrowly lance-attenuate, 3-nerved, the greenish nerves very slender: lemmas subcoriaceous, conduplicate or involute, lance-attenuate, with very delicate nerves; the marginal band appressed-pilose to sericeous or glabrous: palea linear, usually closely embraced by

[1] Wiegand & Eames, Fl. Cayuga L. Basin, 61 (1926).

the strongly folded lemma; the green and ciliate ribs marginal their entire length, the hyaline border abruptly folded toward the middle of the palea: caryopsis linear-lanceolate.

B. DUDLEYI. Panicles 0.6–2 dm. long, their branches scarcely nodding: spikelets mostly purple- or bronze-tinged, rarely green, with crowded lemmas; the rachilla usually hidden: glumes flattish or merely dorsally rounded; the 2d with coarse colored nerves: lemmas flattish, submembranaceous, oblong, obtuse to subacute, strongly nerved; the marginal band conspicuously villous-hirsute especially below the middle: palea oblong, flat, scarcely embraced by the lemma; the ciliolate nerves midway between the entire margin and the middle except at the tip where they become marginal: caryopsis oblong-lanceolate.

These contrasts are brought out in the plate, for which I am indebted to Dr. H. M. Raup and Mr. A. N. Steward, showing spikelets of *B. ciliatus* (FIG. 4) and its variety (to be discussed in succeeding paragraphs) (FIG. 5) and a panicle (FIG. 1), spikelet (FIG. 2) and palea (FIG. 3) of *B. Dudleyi* from the type-collection of that species. For comparison, spikelets of *B. Kalmii* (FIG. 7), *B. Porteri* (FIG. 6) and *B. ramosus* (FIG. 8) are also shown.

Bromus Dudleyi (FIGS. 1–3), as Dudley (quoting Vasey) stated, is nearer related to some Rocky Mountain plants than to true *B. ciliatus* (FIGS. 4 and 5). It occurs itself in British Columbia and Montana and doubtless elsewhere in the Rocky Mountains, where its nearest relative is *B. Porteri* (Coult.) Nash (FIG. 6), but that species has the panicle much looser and the lemmas densely pubescent over their entire surfaces, much as in *B. Kalmii* Gray (FIG. 7) of usually dry soils of the eastern United States. The western specimens of *B. Dudleyi* have been called *B. Richardsoni* Link, but that species closely simulates *B. ciliatus* in its strongly folded or conduplicate and silky-margined lemmas. In habit, early flowering, short cauline leaves, flattish lemmas and flat-margined paleas *B. Dudleyi* is equally close to *B. Kalmii* (FIG. 7), but the latter species of mostly dry habitats from southwestern Maine southward and westward is at once distinguished by the extreme pubescence of its spikelets, shorter and broader lemmas, with shorter awns and more numerous and more prolonged nerves, and narrower paleas with pilose or almost villous nerves.

The original locality of *Bromus canadensis* Michx. Fl. Bor.-Am. i. 65 (1803), recorded on the label as Lake St. John, and Michaux's characters, "foliis rariter pilosis: . . . florum valva exteriore . . . versus margines villosa," suggest that *B. Dudleyi* might be *B. canadensis*. Michaux, however, apparently collected the latter late in the season, long after *B. Dudleyi* is mature ("Le 12 Septembre

. . . arrivé . . . au Poste du lac St Jean . . . Le 13 j'ay herborisé aux environs du Lac."—Journ. André Michaux, ed. Sargent, 85, 86). The other characters given by Michaux might belong to either *B. ciliatus* or *B. Dudleyi* but, fortunately, in the series of fragments of types accumulated by Professor Hitchcock at Washington there is a spikelet of the type of *B. canadensis.* This spikelet, most kindly loaned me for study by Dr. Jason R. Swallen, is not only young but thoroughly characteristic of the late-flowering plant generally accepted as *B. ciliatus.*

Bromus ciliatus L. When I took up[1] *Bromus ciliatus,* forma *denudatus* Wiegand[2] as var. *denudatus,* I pointed out that the plant with glabrous or nearly glabrous median and upper sheaths is far more abundant northward and far less abundant southward than the plant with densely retrorse-villous sheaths. After the removal from the former series of *B. Dudleyi* it becomes important again to note the relative abundance of the two extremes left in *B. ciliatus.* The material before me (in the Gray Herbarium and the herbarium of the New England Botanical Club) shows the following contrasts in relative abundance.

	Labrador Peninsula (Straits of Belle Isle and Cote Nord to James Bay)	Anticosti I. and Gaspé Peninsula	Newfoundland	New Brunswick	Nova Scotia	Southwestern Quebec (Temiscouata Co. to Eastern Townships)	Maine	New Hampshire	Vermont	Massachusetts	Connecticut	New York
Middle and upper sheaths glabrous or only remotely and sparsely pilose	6	30	31	6	8	3	33	14	8	8	0	0
Sheaths densely pilose or villous	0	0	3	3	3	5	45	27	14	16	8	6

Besides being generally more northern, the plant with glabrous or nearly glabrous sheaths shows a strong subalpine tendancy, occurring on the high escarpments of western Newfoundland, on the subalpine meadows (alt. 900–1125 m.) of the Shickshock Mts. of Gaspé, on the Fan of Huntington's Ravine (alt. 1372 m.) on Mt. Washington, New Hampshire, and on the famous cold and subalpine slides of Willoughby, Vermont; it also occurs at the summit of Roan Mt. (alt. 1917 m.),

[1] Fernald, Rhodora, xxviii. 20 (1926).
[2] Wiegand, Rhodora, xxiv. 91 (1922).

North Carolina. Contrasted with this strong subalpine tendency of the smoother plant is the fact that, of the plant with densely villous or pilose upper sheaths not a single specimen from Newfoundland to Ontario and Connecticut has been collected at any appreciable altitude. Furthermore, while the marginal pubescence of the lemmas in the plant with villous upper sheaths is delicate and appressed-sericeous, the pubescence of the lemma in the more boreal glabrous-sheathed extreme is more variable, sometimes appressed-sericeous but more often coarsely pilose. The characteristically pilose-margined lemma and the smooth sheaths are well brought out in the illustration of *B. ciliatus* in Shear, Revis. N. A. Sp. Bromus, fig. 16.[1] Shear did not attempt to differentiate the two extremes of *B. ciliatus*, but Wiegand, in breaking up the species defined his conception of typical *B. ciliatus* as having "Sheaths villous; blades usually hairy," while his forma *denudatus* has "Sheaths glabrous or the lowermost slightly villous; blades usually glabrous."[2] Wiegand's interpretation was accepted unquestioned when I elevated his forma *denudatus* to var. *denudatus*.[3] But, as already pointed out, the designated type of forma or var. *denudatus* is not conspecific with the bulk of the material with glabrous upper sheaths; consequently it is necessary to look anew into the proper names for the varieties of *B. ciliatus*.

The original description of *Bromus ciliatus* L. was as follows:

ciliatus. 4. BROMUS panicula nutante, foliis utrinque vaginisque subpilosis, glumis ciliatis.
Habitat in Canada; *ex semine. D. Kalm.*
Culmi tenues. Folia utrinque & vaginae vix manifeste pubescentes. Panicula valde nutans, non crispis pedunculis. Spiculae oblongae, compressae, petalorum marginibus (non dorso) valde pilosis, qua nota facile distingvitur. Flosculi 8, sub apice aristati; calyces nudi. Glumae corollae lanceolatae.[4]

According to Hitchcock[5] there is nothing in the Linnean herbarium which has the glumes glabrous on the back ("petalorum marginibus (non dorso) valde pilosis") and which can, therefore, be considered a "type." He consequently concluded that we should retain the name *B. ciliatus* for the plant as treated in Shear's monograph. This seems the proper course; and since Shear, in monographing the genus, specially illustrated the plant with glabrous sheaths and pilose-

[1] U. S. Dept. Agric. Div. Agrost. Bull. No. 23: 32. fig. 16 (1900).
[2] Wiegand, Rhodora, xxiv. 90 (1922).
[3] Fernald, Rhodora, xxviii. 20 (1926).
[4] L. Sp. Pl. i. 76, 77 (1753).
[5] Hitchcock, Contrib. U. S. Nat. Herb. xii. 122 (1908).

margined lemmas, this extreme should be taken to stand as true *B. ciliatus*. Fortunately, this is the commoner variety in Canada, whence Kalm secured the seed; and the emphatic statements of Linnaeus that the "sheaths are scarcely manifestly pubescent (vaginae vix manifeste pubescentes)" and that "the margins of the lemmas are conspicuously pilose (petalorum marginibus (non dorso) valde pilosis, qua nota facile distingvitur)" make it reasonably clear that Shear's illustration truly embodies[1] the important characters of the Linnean plant. This interpretation, that Linnaeus had the common plant of northeastern Canada with scarcely pubescent sheaths gains support from the fact that, in the *Species Plantarum*, *B. ciliatus* with "vaginae vix manifeste pubescentes" came immediately after Linnaeus's other American species, *B. purgans*, in which the sheaths are rarely so pubescent as in the villous-sheathed extreme of *B. ciliatus*. Yet Linnaeus described *B. purgans* as having "*Vaginae foliorum retrorsum pilosae.*" *B. canadensis* Michx. seems to have been based on small specimens of true *B. ciliatus*.

For the less boreal plant with villous sheaths I find no published name. I am therefore designating the two varieties as follows:

Bromus ciliatus L., var. **genuinus.** *B. ciliatus* L. Sp. Pl. i. 76 (1753). *B. canadensis* Michx. Fl. Bor.-Am. i. 65 (1803). *B. ciliatus* Shear, U. S. Dept. Agr. Div. Agrost. Bull. No. 23, fig. 16 (1900). *B. ciliatus*, forma *denudatus* Wiegand, Rhodora, xxiv. 90 (1922), in large part but not as to type. *B. ciliatus*, var. *denudatus* (Wieg.) Fern. Rhodora, xxviii. 20 (1926), in large part but not as to type.—Middle and upper sheaths glabrous or nearly so: margin of lemma pilose to sericeous.—Newfoundland and southern Labrador Peninsula to Manitoba, south to Nova Scotia, Massachusetts, northern Ohio, Michigan, Wisconsin and North Dakota, often ascending to subalpine areas; Roan Mt., North Carolina.

Var. **intonsus**, n. var., vaginis mediis superioribusque villosissimis vel valde retrorse-pilosis; lemmatis marginibus sericeis.—Newfoundland and southern Quebec to southern Ontario, south at low altitudes to Pennsylvania and Michigan. Type: Ashfield, Massachusetts, August 4, 1909, *E. F. Williams* (in Gray Herb.).

All the older sheets of *B. ciliatus* var. *intonsus* in the Gray Herbarium were labeled in the hand of William Boott or of Asa Gray *B. asper;* and this variety formed the basis of the entry in Gray's Manual, ed. 5, of *B. asper* from "Bethel, Maine, in fields along the river-bank, *W. Boott.* (Nat. from Eu.)"[2] and the more ample range in

[1] Except for the superabundance of lemmas.
[2] Gray, Man. ed. 5: 635 (1867).

ed. 6: "N. Brunswick to Mich. and Ky. (Nat. from Eu.)."[1] The record was taken over by Britton & Brown and in their Illustrated Flora, ed. 2, is entered as "In waste places, New Brunswick to Michigan and Kentucky. Naturalized from Europe."[2] That William Boott and Asa Gray were not quite convinced that the plant they called *B. asper* was really an introduction is shown by the penciled memoranda in Gray's hand, obviously inspired by the field knowledge of Boott, on some of the labels: "native"; nevertheless this pertinent and most important item did not find an entry into the Manual. In his monographic study of the genus in North America, Shear, taking up for *B. asper* Murr. (1770) the earlier name *B. ramosus* Huds. (1762), said: "A species introduced from Europe. It is said in Britton and Brown's 'Illustrated Flora' to be distributed from New Brunswick to Michigan and Kentucky. We have no American specimens in the National Herbarium."[3] Had he realized the sources of Gray's and Britton & Brown's records, Shear could have added that there were no American specimens of *B. ramosus* (*B. asper*) extant and that the original identification was an error; for *B. ramosus* of Europe (FIG. 8) differs from the American plant mistaken for it in its pubescent culms, narrower and much prolonged panicle, more remote and longer lemmas with longer awns, and anthers very much longer (4 mm. long).

EXPLANATION OF PLATE 196

(Figures × 1¾)

FIG. 1, panicle of BROMUS DUDLEYI (from type-number); FIG. 2, spikelet of B. DUDLEYI; FIG. 3, inner face of lemma, showing flat palea; FIG. 4, spikelet of B. CILIATUS, var. GENUINUS from Table–top Mountain, Quebec (*Fernald & Collins*, no. 169); FIG. 5, spikelet of B. CILIATUS, var. INTONSUS from the type; FIG. 6, B. PORTERI from type-locality, Twin Lakes, Colorado (*Wolfe*, no. 807); FIG. 7, B. KALMII from the assumed type, Troy, New York, *Asa Gray;* FIG. 8, B. RAMOSUS (*B. asper*) from Bavaria (*Fl. Exsicc. Bav.* no. 597).

V. SOME VARIETIES OF THE AMPHIGEAN SPECIES OF OSMUNDA

M. L. FERNALD

THREE species of Osmunda are found on both of the northern continental masses, Eurasia and North America. One of them extends into tropical South America, another into subtropical and tropical

[1] Wats. & Coult. in Gray, Man. ed. 6: 670 (1890).
[2] Britton & Brown, Ill. Fl. ed. 2, i. 275 (1913).
[3] Shear, U. S. Dept. Agric. Div. Agrost Bull no. 23: 30 (1900).

Africa, and five additional species are Asiatic endemics and a sixth South American. In a recent attempt to determine the degree of identity or of segregation of the three amphigean species in the Northern Hemisphere certain parallel variations in the three which apparently have not been generally recognized by students of the ferns have come to my attention.

Osmunda regalis and its var. spectabilis. For more than a century systematists have wavered in their estimate of the American *Osmunda regalis* L., sometimes treating it as a species, *O. spectabilis* Willd. Sp. Pl. v. 98 (1810), sometimes as an American variety, *O. regalis*, var. *spectabilis* (Willd.) Gray, Man. ed. 2: 600 (1856), and often as not separable from the European type. In European descriptions *O. regalis* is very generally stated to be 4 to 6 feet (1.2–1.8 m.) high and most accounts tell of exceptional colonies reaching a height of 12 feet (3.6 m.), but in dry or sterile habitats and toward the northern limit of its range the European plant may be only 2–4 feet (0.6–1.2 m.) high, and in the dwarf var. *pumila* Milde it is extraordinarily low, only 9 inches (2.2 dm.) high. The plant of eastern North America (Newfoundland to the Saskatchewan, south to Florida and Texas) certainly reaches no such height as 3.6 m. (12 feet); in fact, the measurements with us were accurately stated by the late D. C. Eaton when he wrote: "The fronds of the royal fern are said to attain the height of ten or eleven feet in the British Islands; but the highest I have ever seen were from the valley of the Connecticut River, and measured six feet from the ground. Fronds four or five feet high are not at all rare; but more commonly the fronds, including the stalk . . . stand from two to four feet high. In dryish marshes they are often not more than a foot or fifteen inches high."[1] Had Eaton seen the American plant at the northeastern limit of its range, in eastern Quebec and Newfoundland, he would have brought his minimum measurements down even lower than those of the European var. *pumila*, for on the barren slopes of western Newfoundland, in eastern Quebec and at the altitudinal limit of the fern on Mt. Katahdin, Maine, it is often less than 8 inches (2 dm.) high. Surely, if there were any truth in the oft-repeated tale of Osmund, the ferryman, hiding his wife and daughter in the shade of the Royal Fern, it is clear that the dramatic incident would find greater probability when linked to the tall extreme of the European plant than it would if visualized as occurring in the tell-tale shade of our low American representative of it!

[1] Eaton, Ferns N. Am. 1. 213 (1879).

Numerous characters, narrower and more remote pinnules without basal auricle, finer serrulation, the presence of a bloom, and more slender fruiting panicles, have been emphasized as distinguishing *O. spectabilis* from *O. regalis;* but, although extreme specimens are easily separated, these points are by no means constant and apparently identical pinnules with or without auricles can be found on either continent, while bright-green and glaucous plants are both common with us. The generally lower stature and generally more slender or more delicately branched panicle of the American plants seem to be real tendencies; and in studying the plants of the two continents I find another character which has either been overlooked or not much stressed. On the rachises of the fruiting panicles of true *Osmunda regalis* I find numerous rather persistent black scale-like trichomes; on the rachises of the panicles of *O. spectabilis* I find none of them or, at most, a few elongate axillary hairs. This difference is so real in all material fit for comparison that, combined with the other strong, though far from constant tendencies of the plants it may be taken as the diagnostic character of a reasonably good geographic variety. I am, therefore, maintaining our plant as O. REGALIS L., var. SPECTABILIS (Willd.) Gray.

O. CLAYTONIANA AND ITS VAR. VESTITA. It is generally stated that *Osmunda Claytoniana* L. has three disrupted areas of distribution: eastern North America (Newfoundland to Lake Mistassini and Lake Winnepeg, south to North Carolina, Kentucky and Missouri), eastern Asia (Japan and Corea to the Himalayas) and Brazil. The plant of North America has the very young fronds more or less wooly with whitish-brown tomentum. This is promptly deciduous and persists on the older fronds only as cobwebby remnants, but always of a pale-brown color. The plant of the Himalayan region, however, has more abundant and, apparently, more persistent wool of a strong ferruginous color.

The name of the Himalayan variety is OSMUNDA CLAYTONIANA, var. VESTITA (Wall.) Milde, Monogr. Gen. Osmundae, 102 (1868). Wallich, Cat. no. 52 (1829) had the *nomen nudum:* "*Osmunda monticola*, Wall. Kumoon, R. B.," followed by "*β. vestita, frondibus apice fertilibus.*" In 1833, Wallich's no. 52, recorded by him as *O. monticola*, collected in Kumoon by Robert Blinkworth ("R. B."), was formally described by Greville & Hooker as

3. O. pilosa *Wall.*
   Frondibus ovato-lanceolatis pinnatis (junioribus densissime ferrugineo-lanatis) . . . —*Wall. Cat. No.* 52.

> Hab. Rio Janeiro, *Dr. Wallich.*—This is very closely allied to *O. interrupta* of North America, which differs, however, ... in its glabrous fronds; but, if we are not mistaken, the latter is covered in a young and recent state with a ferruginous down, in which case we scarcely know how the present plant is to be distinguished, except by its larger size, and denser pinnae, ..."[1]

Osmunda monticola Wall. was unquestionably a *nomen nudum* but his var. *vestita* of it had a phrase of description. Greville & Hooker definitely described no. 52, not as *O. monticola*, but as *O. pilosa* (ascribed to Wallich), "Frondibus . . . junioribus densissime ferrugineo-lanatis." This characterization is correct for all Himalayan material I have seen; and since Milde, although not distinguishing the Himalayan plant in general from the American, took up *O. monticola*, β. *vestita* Wall. Cat. no. 52 as *O. Claytoniana*, var. *vestita* (Wall.) Milde, Monogr. Gen. Osmund. 102 (1868), we may use that varietal name for all the Himalayan plants. Var. *vestita* was intended technically as the name for an unusual form hardly worthy varietal recognition, but, here extended, it covers the Himalayan plant with rufescent wool, as contrasted with true *O. Claytoniana*, in which the wool is whitish-brown. Whether the plant of easternmost Asia is all the same as the Himalayan I cannot say, as the Asiatic material in the Gray Herbarium is all from the Himalayan area; but the Asiatic plant is presumably all of a single variety. The material from the high mountains of Yunnan, at least, seems to be var. *vestita*, for Dr. Christensen, taking it to be a new variety, has published it as var. *lanosa* Ch. Christens. in Levéillé, Cat. Pl. Yun-nan, 107 (1916), with the description identical in substance ("Rachis ut in O. cinnamomea L. tomento rufo densissime tecta") with that of the earlier *O. pilosa* Wall. which was based on Wallich's no. 52, which was also the type of *O. Claytoniana*, var. *vestita* (Wall.) Milde.

The habitat "Rio Janeiro," given by Greville & Hooker for Wallich's plant has been thoroughly misleading. In his *Monographia Generis Osmundae* (1868), Milde gave the range of *O. Claytoniana* as "**Nord America**: . . . **Süd Amerika:** Rio Janeiro. (Wallich). **Asia**"; and in his *Ferns of North America* (1879), Eaton said "has been attributed to Brazil, near Rio Janeiro, though probably by an error of Wallich's."[2] The error was not Wallich's, however, but Greville & Hooker's. Wallich clearly gave his no. 52 as coming from Kumoon; but the next following, no. 53, *Aneimia flexuosa*, was listed as coming from "Rheo Janeiro 1807." It is obvious that, in copying, Greville

[1] Grev. & Hook. in Hook. Bot. Misc. iii. 229 (1833).
[2] Eaton, Ferns N. A. i. 220 (1879).

& Hooker passed over the correct locality and collector of no. 52, the basis of *O. pilosa* and of *O. Claytoniana*, var. *vestita*. It is also evident that the Brazilian record of *O. Claytoniana* may safely be dropped.

O. CINNAMOMEA AND ITS GEOGRAPHIC VARIETIES. *Osmunda cinnamomea* L., like *O. Claytoniana*, occurs in eastern America (Newfoundland to Georgian Bay, Ontario and Wisconsin, south to northern Florida, Alabama and Texas; with var. *imbricata* from the Bermuda Islands and Florida to Louisiana, south to tropical Mexico and Brazil) and *O. cinnamomea* is usually said to occur in eastern Asia (Amur, Manchuria and Sachalin Island to Yunnan). But just as the Eurasian *O. regalis* differs from the eastern American *O. regalis*, var. *spectabilis* in having black scale-like trichomes on the rachises of the fruiting panicle and the Himalayan *O. Claytoniana*, var. *vestita* differs from the eastern American plant in having much darker and more persistent wool, so the eastern Asiatic *O. cinnamomea* is at once distinguished from typical *O. cinnamomea* of temperate eastern America by having the tomentum of the stipes, rachises and fertile fronds rufescent, that of the fertile fronds with many black trichomes intermixed, the tomentum of typical *O. cinnamomea* being whitish-brown without any black admixture.

The plant of tropical and subtropical eastern America, O. CINNAMOMEA, var. IMBRICATA (Kunze) Milde, Mongr. Gen. Osmund. 95 (1868), has the tomentum more rufescent than in typical *O. cinnamomea* but it, likewise, lacks the black admixed trichomes of the Asiatic plant.

The three geographic varieties may be distinguished as follows:

O. CINNAMOMEA L., var. **typica.** *O. cinnamomea* L. Sp. Pl. ii. 1066 (1753). *Struthiopteris cinnamomea* (L.) Bernh. Schrad. Journ. 1800[2]: 126 (1801). *Osmundastrum cinnamomeum* (L.) Presl., Abh. Böhm. Ges. Wiss. ser. 5, v. 326 (1848).—Tomentum of stripes, rachises and fertile fronds whitish-brown: mature sterile pinnae 1.5–3.5 cm. broad, membranaceous, translucent; the veinlets scarcely elevated beneath.—Temperate eastern North America.

Var. IMBRICATA (Kunze) Milde, Mongr. Gen. Osmund. 95 (1868). *O. bipinnata* L. Sp. Pl. ii. 1065 (1753).[1] *O. imbricata* Kunze, Farnkr. ii. 29, t. cxii. (1849).—Tomentum brown to rufescent: mature sterile pinnae 1–2.3 cm. broad, subcoriaceous, opaque; the veinlets somewhat prominent beneath.—Tropical and subtropical eastern America.

Var. **asiatica**, var. nov., lamina fertili plus minusve nigricanti-villosa; stipitum rhachiumque vestimento rufescenti.—Amur, Man-

[1] *O. bipinnata* was published by Linnaeus on the page preceding the publication of *O. cinnamomea*. By those who accept the principle of "priority of position" *O. bipinnata* should be used instead of the more familiar *O. cinnamomea*.

churia and Sachalin Island to Yunnan; the following are characteristic. Amur: without designation of locality, *Maximowicz;* Amur medius, 1891, *S. Korshinsky* (type in Gray Herb.). Manchuria: between Mukden and Tungche-shien, 1886, *H. E. M. Jones.* Sachalin: without designation of locality, *Augustinowicz.* Japan: Hokodati, 1853–56, *J. Small* (U. S. No. Pacif. Expl. Exped.); Yokohama, 1862, *Maximowicz.*

It is perhaps not without interest to note that the very marked tendency of the Eurasian varieties of *Osmunda regalis, Claytoniana* and *cinnamomea* to have deeper-colored trichomes or darker and firmer scales than the eastern American plants is quite parallel with the situation in some other varieties or closely allied species of ferns. It has long been recognized that the Eurasian *Thelypteris spinulosa* (Muell.) Nieuwl. var. *dilitata* (Hoffm.) St. John has firm blackish scales on the stipe and that these often extend well along the rachis or even to the rachillas, while the eastern American representative, *T. spinulosa,* var. *americana* (Fischer) Weath. has thin and translucent soft and pale-brown scales which are more promptly deciduous.[1] Again, in European *Polystichum Braunii* "The largest scales of the stipe-bases . . . are rather firm . . . ; in the eastern American [var. *Purshii* Fernald] they are much thinner."[2] Other cases (European *Polypodium vulgare* L. and eastern American *P. virginianum* L., European *Asplenium Ruta-muraria* L. and eastern American *A. cryptolepis* Fernald; etc.) could be cited, in which species of eastern America and their representatives in Europe have apparent differences in the texture and often the depth of coloring of their scales. These characters are small but the scales seem to have evolved along quite definite lines on the two continental masses; and doubtless study of other ferns will bring to light parallel situations in other groups.

VI. POTAMOGETON ALPINUS AND P. MICROSTACHYS

M. L. Fernald

(Plate 197)

In 1827 Wolfgang, receiving material from the Aleutian Islands of a plant related to the European *Potamogeton alpinus* Balbis (1804) or *P. rufescens* Schrader (1815), proposed it as a new American species:

[1] For detailed discussion see Fernald, Rhodora, xvii. 45–47 (1915).
[2] Fernald, Rhodora, xxx. 29 (1928).

POTAMOGETON *microstachys W o l f g.;* caule simplici, tenui; foliis lineari-lanceolatis, subsessilibus, obtusiusculis, utrinque attenuatis, 5-nervibus: nervo medio crassiusculo, reticulato-venosis; stipulis internodia subaequantibus; pedunculis tenuibus, foliis brevioribus; spicis terminalibus, paucifloris. *W o l f g. Ms. n.* 15, *B e s s e r in litt.*

Specimina nostra, a cel. *Eschscholtz* in *U n a l a s c h k a* lecta, nondum sat evoluta, dum unicâ solum spicâ sint instructa, et caulis 8-pollicaris et internodia brevia; videntur ex aqua stagnante. Folia 4–5-poll., 2–3 lin. lata. *W o l f g.*[1]

At approximately the same time Chamisso,[2] apparently unaware of the conclusion of Wolfgang and discussing the pondweeds collected on the Romanzoff expedition, correctly defined *P. alpinus* (as *P. rufescens*) and showed in his illustrations (t. V. fig. 18) the distinctive fruit of the European plant, "Nux . . . stylo subapicali acuminata." In discussing the variations of the species Chamisso mentioned narrow-leaved and broad-leaved forms and under the "Forma angustifolia" the Unalaska material which was doubtless the basis of Wolfgang's *P. microstachys:*

Specimina, quae ipsi in stagnis frigidis insulae Unalaschca Aleutorum carpsimus, jam spicigera, nondum efflorata, huc non referre nequimus. Folia ad summum 4 pollicum longitudinem attingunt, 2–3 lin. lata, obtusa, septemnervia, nervo medio utriusque lateris paginae validiore. Internodia fere pollicaria. Spica brevis, pauciflora (nondum florens). Caulis spithamaeus. Folia natantia in nonnullis individuis jam incipientia. Semina non vidimus.[3]

Twenty years later, Alphonso Wood, getting into northeastern Vermont where the American plant which had already been described by Wolfgang and by Chamisso abounds, took it to be a new species and gave the first accurate account of its fruit, "subhemispherical, margined on the back, beak incurved." Wood's species was

P. OBRUTUS. Wood. *Lyndon Pond-weed.*

Lvs. glossy, linear-lanceolate, sessile, rather acute, only the midvein conspicuous, alternate, approximate, the lower stipules wanting; *spikes* long-pedunculate; *achenia* inflated, subhemispherical, margined on the back, beak incurved both sides, conspicuously umbilicate.—Passumpsic river, Lyndon, Vt.! A remarkable species, differing widely from any other with which I am acquainted. Stem round, slender, simple. Leaves uniform, 3–4′ by ½′, tapering to the slightly clasping base, the two upper opposite. Spike dense, 1½′ long, peduncle 3′ in length. Fruit with 2 little pits.[4]

But in spite of Wood's clear characterization of the fruit of the American plant, his species, *P. obrutus*, and Wolfgang's earlier *P.*

[1] Wolfg. in Schultes & Schultes, Mantissa, iii. 360 (1827).
[2] Cham. in Cham. & Schlecht. Linnaea, ii. 210-213, t. V, fig. 18 (1827).
[3] Cham. l. c. 211 (1827).
[4] Wood, Class-Bk. ed. 2: 525 (1847).

microstachys were quickly reduced and, so far as I can find, have never received the recognition they clearly merit. In 1856 Gray reduced to *P. lucens* L. an amazing number of species not then at all understood by him, *P. fluitans* Roth, *P. pulcher* Tuckerm., *P. amplifolius* Tuckerm. and *P. rufescens* Schrad., "a narrow-leaved form, with smaller fruit, &c., either without floating leaves (P. obrutus, *Wood*) or with them";[1] and this most unsatisfactory grouping was maintained by Gray until 1867. In that year Robbins's very clear and satisfactory differentiation of these species appeared,[2] but he still maintained *P. obrutus* as inseparable from *P. rufescens*. In 1893 Morong took up[3] in place of *P. rufescens* Schrad. the earlier name *P. alpinus* Balbis, but nowhere in his monograph did he mention either of the names, *P. microstachys* and *P. obrutus*, which had been given to supposedly distinct American species. Morong's plate, however, showed the characteristic fruit of the American plant, the "subhemispherical" fruit of Wood, with strongly rounded back and with very short beak at the summit of the ventral face; rather than the "Nux . . . stylo subapicali acuminata" of the European plant as correctly described and illustrated by Chamisso and as shown in such early European illustrations as Hornemann, Fl. Danica, ix. fasc. xxv. t. mcccl (1813) and x. fasc. xxviii. t. mdcxxxv (1819), Reichenbach, Ic. Crit. ii. t. clxxxiv (1824) and Fieber, Die Potamogeta Böhmens, t. i. fig. 4 (1838). Susbequent American authors have consistently followed Morong.

As already noted, Wolfgang and Chamisso, having young material "(nondum florens)," emphasized the narrower and few-nerved submersed leaves of the American plant; and in recent years some European students of *Potamogeton* have similarly commented upon a slight habital difference between the American and eastern Asiatic plant on the one hand, and true *P. alpinus* of Europe on the other but, so far as I can find, they have made no comparison of the mature fruits. Thus, in 1904, the late Arthur Bennett[4] published the following note:

> P. ALPINUS Balb. (*P. rufescens* Schrad.). On the receipt of a sheet of specimens of this species from the herbarium of Prof. Kinashi, of Japan, I was impressed by the dark colour (almost black), the narrow leaves, and the absence of floating leaves. On looking up my Asiatic and American specimens, I found that all the former were of the same tint, and lacked floating leaves; out of eleven American examples only one had any sign of them, and in the British Museum Herbarium they are present in only one example.

[1] Gray, Man. ed. 2: 435 (1856).
[2] Robbins in Gray, Man. ed. 5: 486, 487 (1867).
[3] Morong, Naiadaceae of N. Am.—Mem. Torr. Bot. Cl. iii. No. 2: 19, t. xxx (1893).
[4] Bennett, Journ. Bot. xlii. 72 (1904).

Dr. Robbins, in Gray's *Manual*, ed. 5, 486 (1879), says, "floating leaves often wanting (*P. obrutus* Woods)." These dark-coloured narrow-leaved forms are the *P. rufescens* "forma angustifolia" of Chamisso (*Linnaea*, ii. 211 (1827) = *P. microstachys* Wolfgang in Roem. & Schultes, *Mantissa*, iii. 360 (1827).

These specimens look very different from the forms named *P. nerviger* Wolfg. (*l. c.* 359) and those named var. *maximus* Mert. & Koch, Deutschl. Fl. i. 841 (1823), and were it not for the numerous connecting links might well be considered a distinct species.

Subsequently in *Das Pflanzenreich* Graebner, after giving the range of *P. alpinus*, added the "Nota 1. Specimina americana a me visa omnia angustifolia sunt";[1] and, taking his cue from Bennett's note already quoted, Graebner set up *P. alpinus*, proles *microstachys* (Wolfg.) Graebn., based on *P. microstachys* Wolfg., with *P. rufescens* "forma angustifolia" Cham. and *P. obrutus* Wood as synonyms. Proles *microstachys* was defined: "Folia submersa angustiora, fluitantia saepissime absunt. Planta exsiccata nigrescens" and its only geographic range was "Ostasien verbreitet," Graebner obviously overlooking the fact that the type of *P. microstachys* was from Alaska and of *P. obrutus* from Vermont.

In general, the American plants which pass as *Potamogeton alpinus* do have narrower or smaller leaves than the European plants. The commonest extreme of the American plant (*P. microstachys* or *P. obrutus*) has the submersed leaves linear-lanceolate and acute or subacute, only rarely obtuse, much resembling those of the larger extreme of *P. epihydrus* Raf. They range from 0.7–2.5 dm. in length and 5–15 mm. in breadth and have usually 7 primary nerves (sometimes only 5, rarely 9 or 11). The other extreme of the American series is less common, a plant with narrowly elliptic-oblong round-tipped or very obtuse submersed leaves 4–8 (rarely –12) cm. long, 0.8–2 cm. broad and 7–13-nerved. When fresh the plants of both varieties are reddish or a warm reddish-green and even in the dried condition they retain the red in the younger parts, but I can see no more black in them than in the European material before me. The leaves of the American series are certainly narrower or smaller than in the European. Our narrowest-leaved plant (*P. microstachys* or *P. obrutus*) is comparable with the narrowest-leaved plant of Europe (*P. alpinus*, var. *angustifolius* (Tausch.) Aschers. & Graebn.) but the foliage of the broader-leaved plant of Europe is much larger than in ours, "usque ad 2 dm fere longa et 2,5 cm lata" (*Graebner*) and mostly 15–17-nerved, and in forma *ovatifolius* Hagström even 3.5 cm. broad.

[1] Graebner in Engler, Pflanzenr. iv.[111]. 72 (1907).

During anthesis our plant has a decidedly moniliform spike with the flowers quite remote (Pl. 197, spike at right), but at the same stage of development the European series shows more continuous spikes (spike at left), the flowers more approximate than in ours. In young fruit the two are difficult to separate, but when the fruits are quite mature they show the marked contrast which was brought out in the descriptions earlier quoted from Chamisso's account of European *P. alpinus* and Wood's characterization of the American *P. obrutus:* the mature fruits of the European plants are narrowed and subequally attenuate to the prolonged submedian beak; those of the American and eastern Asiatic series broader, strongly rounded at the summit of the broad dorsal keel and laterally beaked at the summit of the ventral margin merely by a very short but often incurving style. The photograph (Plate 197), generously supplied by Dr. Hugh M. Raup and Mr. Albert N. Steward, shows a series of mature fruits (enlarged to 2 diameters), those of the European plant (with a flowering spike below) at the left (figs. 1–16), those of the American and eastern Asiatic (with a characteristic flowering spike below) at the right (figs. 17–37). These fruits, taken from every mature European specimen in the Gray Herbarium and from a fully representative series of the American plant, hold consistently to the differences already enphasized. Associated with marked geographic segregation, differences in the foliage and in the degree of crowding in the flowering spike, the essentially dissimilar fruits indicate that, when Wolfgang described the quite immature *P. microstachys* in 1827 and when Wood twenty years later accurately described the fruit of his *P. obrutus*, they were distinguishing from European *P. alpinus* a well defined American and eastern Asiatic species.

For a plant with mature spikes 1.5–3.5 cm. long and 7–10 mm. thick the name *Potamogeton microstachys* would be inexplicable except for the clear statements, already quoted, that the Unalaska type was not yet in flower "(nondum florens)." The implication of Wood's name *P. obrutus* and assertions by him and by European students that the American plant lacks or but rarely develops floating-leaves is almost as unfortunate: of the 195 flowering or fruiting specimens in the Gray Herbarium and the herbarium of the New England Botanical Club 86 lack floating leaves, 109 (a clear majority) have them.

As already stated, *Potamogeton microstachys* has two rather strongly defined variations. These are

Potamogeton microstachys Wolfg., var. **typicus.** *P. micro-*

stachys Wolfg. in Schultes & Schultes, Mantissa, iii. 360 (1827). *P. rufescens*, "Forma angustifolia" from Unalaska, Cham. in Cham. & Schl. Linnaea, ii. 211 (1827). *P. obrutus* Wood, Class-Bk. ed. 2: 525 (1847). *P. rufescens* Am. auth. in large part, not Schrad. *P. alpinus* Am. auth. in large part, not Balbis. *P. alpinis*, Proles *microstachys* (Wolfg.) Graebn. in Engler, Pflanzenr. iv[11]. 72 (1907).—Submersed leaves linear-lanceolate or narrowly lanceolate, acute or subacute to obtuse, 0.7–2.5 dm. long, 0.5–1.5 cm. broad, usually 7 (5–11)-nerved.—Southern Greenland and Labrador to Alaska, south to Newfoundland, Nova Scotia, Maine, western Massachusetts, New York, Michigan, Colorado, Utah and California. The following are characteristic specimens. GREENLAND: Qagssiarssuk, Igaliko-Fjord, 60° 53′ N., August, 1925, *Porsild & Porsild*. LABRADOR: Rama, *Stecker*, no. 332. NEWFOUNDLAND: Little Quirpon, *Wiegand & Hotchkiss*, no. 27,337; pools at 400–550 m., Lookout Mountain, *Fernald, Long & Fogg*, no. 1207; Grand Falls, *Fernald, Wiegand & Darlington*, no. 4474; Carbonear, *Fernald & Wiegand*, no. 4473; George's Pond, *Fernald & Wiegand*, no. 2443. QUEBEC: Natashquan, *St. John*, nos. 90,083, 90,084; Cap à l'Aigle, *J. Macoun*, no. 68,919; Black Lake, *Fernald & Jackson*, no. 11,987; Lac William, *Victorin*, no. 11,162; Sargent's Bay, Lake Memphremagog, August 3, 1903, *Churchill*. NEW BRUNSWICK: Connors, *Pease*, no. 2907. NOVA SCOTIA: Truro, *Bean & White*, no. 22,963. MAINE: St. Francis River, August 13, 1902, *Eggleston & Fernald;* Madawaska, *Fernald*, no. 117; Ashland, 1881, *Kate Furbish;* Monticello, *Fernald & Long*, no. 12,386; Veazie, September, 1897, *Fernald;* Milo, September 2, 1897, *Fernald;* Dover, August 27, 1894, *Fernald;* Sydney, *Fernald & Long*, no. 12,388; Rangeley, 1894, *Furbish;* Pembroke, *Fernald*, no. 1622. NEW HAMPSHIRE: Northumberland, *Robbins*, also *Pease*, no. 17,270; Pondicherry Pond, Jefferson, 1829, *Robbins;* Hanover, July 12, 1910, *Williams*. VERMONT: "e flumine Passumpsic," *A. Wood* (original collection of *P. obrutus*); West Barnet, 1880, *F. Blanchard*. MASSACHUSETTS: Richmond, September 19, 1864, *J. W. Robbins*. NEW YORK: creeks at foot of Lake George, *Tuckerman;* Dexter, *Fernald, Wiegand & Eames*, no. 14,082. ONTARIO: Current River, *J. Macoun*, no. 94. MICHIGAN: Isle Royale, *W. S. Cooper*, no. 254 in part. MANITOBA: near Cumberland House, *Drummond*. MONTANA: Shoshone Lake, *Rydberg & Bessey*, no. 3724 (distributed as *P. Zizii*). COLORADO: Georgetown, *M. E. Jones*, no. 734; Seven Lakes, *Clements*, no. 491; Lake Eldora, Boulder Co., *Clokey*, no. 3118 (as *P. praelongus*). UTAH: Alta, *M. E. Jones*, no. 1297; Big Cottonwood Canyon, August, 1904, *Garrett*. CALIFORNIA: Silver Valley, *Brewer*, no. 1978. WASHINGTON: Mt. Adams, 1879, *Suksdorf;* Trout Creek, *Suksdorf*, no. 2172. BRITISH COLUMBIA: Revelstoke, *J. Macoun*, no. 4163. ALASKA: Kadiak Island, *Trelease*, no. 2870; Unalaska (the TYPE-LOCALITY), *Van Dyke*, no. 202. SIBERIA: Krestovskoi Islands (at mouth of Kolyma River), sent by *Regel*. AMUR: Amur Medius, 1891, *Korshinsky*. JAPAN: Sapporo, 1903, *Arimoto*.

Var. **subellipticus**, var. nov., foliis submersis anguste oblongo-ellipticis 4–8(–12) cm. longis 0.8–2 cm. latis 7–13-nerviis apice rotundatis vel obtusis.—Newfoundland to British Columbia, south to Maine, Vermont, Michigan and Wyoming. Newfoundland: shallow pools in limestone barrens, Flower Cove, July 28, 1924, *Fernald, Long & Dunbar*, no. 26,221; *Hotchkiss*, no. 27,338; shallow pools, Stephenville, August 15, 1910, *Fernald, Wiegand & Kittredge*, no. 2442; pond 4 miles northeast of Port à Port, *Mackenzie & Griscom*, no. 10,047 Quebec: pool in tundra, Ile Ouapitagone, July 14, 1915, *St. John*, no. 90,085; ruisseau sur les dunes, Rivière Goynish, *Victorin & Rolland*, no. 18,575; étangs des tourbières calcaires, Ile à la Proie, Mingan, 20 juillet 1925, *Victorin & Rolland*, no 20,462; étangs calcaires, Grande Ile, Mingan, 20 juillet 1925, *Victorin & Rolland*, no. 20,468; eaux tranquilles, Riv. au Saumon, Anticosti, 3 août 1925, *Victorin, Rolland & Louis*, no. 20,467; Riv. Sainte-Marie, Anticosti, 2 août 1926, *Victorin & Rolland*, no. 25,938; shallow pools, Seal Cove River, Douglastown, August 22, 1904, *Collins, Fernald & Pease;* "Petit Bassin," Riv. Ste. Anne des Monts, August 17, 1906, *Fernald & Collins;* small pond on river-flat, Riv. Cap Chat, August 27, 1923, *Fernald & Smith*, no. 25,420; shallow pool, Bonaventure River, August 8, 1904, *Collins, Fernald & Pease;* brook, Georgeville, July 27, 1902, *Pease*, no. 1919. Magdalen Islands: shallow pools, Coffin Island, August 27, 1912, *Fernald, Long & St. John*, no. 6766 (type in Gray Herb.); étangs, Ile du Hâvre-au-Ber, 17 juillet 1919, *Victorin & Rolland*, no. 9923. Nova Scotia: cold shallow brook, Baddeck Bay, August 27, 1920, *Fernald & Long*, no. 19,687. Maine: rills, Houlton, July 13, 1916, *Fernald & Long*, no. 12,387; shallow brook, Foxcroft, September 5 and 15, 1894, August 31, 1896, *Fernald*, Vermont: pond near Willoughby Lake House, August 4 and 11, 1881, *Faxon*, June 10, 1895 and September 15, 1899, *Kennedy;* Nigger Pond, alt. 1750 ft., Westmore, August 3–10, 1916, *Eames & Godfrey;* Little Leech Pond, Averill, August 7, 1899, *Eggleston*, no. 1656. New York: Minerva Brook, east of Minerva, August 6, 1927, *House*, no. 15,182. Michigan: Eagle Harbor, Keweenaw Peninsula, 1863, *Robbins;* shallow ponds, Keweenaw County, August, 1890, *Farwell*, no. 514. Wyoming: Branch of Sweetwater, Wind River Mts., East Fork of Big Sandy, and Heart Lake Creek, 1878, *C. Richardson*. British Columbia: Kicking Horse Lake, August 17, 1890, *J. Macoun*.

Explanation of Plate 197

(All figures × 2)

Spike at left and Figs. 1–16, Potamogeton alpinus: 1, from Ballynahinch, Ireland, *ex Nat. Mus. Irel.;* 2, Shropshire, England, *Leighton;* 3, Savoie, *Perrier;* 4, Längenfeld, Tirol, *Zimmeter*, no. 2683; 5, Coburg, Bavaria, *Schack;* 6, Eversen bei Westerwalsede, Germany, *Buchenau;* 7, Thüringen, *Rehder;* 8, Bavaria, *G. Fischer*, no. 481; 9, Bavaria, *Fischer*, no. 482; 10, Bavaria, *Fischer*, no. 342; 11, Coburg, Bavaria, *Schack;* 12, Germany, *Sennholz;* 13, Bräcke, Jemtland, Sweden, *Tiselius*, no. 15k; 14, Ostrogothia (Linköping),

Sweden, *Ekeroth;* 15, Christiania (Oslo), Norway, *Blytt;* 16, Torne Lappmark, *Laestadius.*

Spike at right and Figs. 17–37, P. MICROSTACHYS: 1, from Carbonear, Newfoundland, *Fernald & Wiegand*, no. 4473 (var. *typicus*); 18, Flower Cove, Newfoundland, *Hotchkiss*, no. 27,338 (var. *subellipticus*); 19, Grand Falls, Newfoundland, *Fernald & Wiegand*, no. 4474 (var. *typ.*); 20, Stephenville, Newfoundland, *Fernald & Wiegand*, no. 2442 (var. *subel.*); 21, Natashquan, Quebec, *St. John*, no. 90,083 (var. *typ.*); 22, Magdalen Islands, *Fernald, Long & St. John*, no. 6766 (var. *subel.*); 23, Truro, Nova Scotia, *Bean & White*, no. 22,963 (var. *typ.*); 24, Madawaska, Maine, *Fernald*, no. 117 (var. *typ.*); 25, Foxcroft, Maine, *Fernald* (var. *subel.*); 26, Sydney, Maine, *Fernald & Long*, no. 12,388 (var. *typ.*); 27, Pembroke, Maine, *Fernald*, no. 1622 (var. *typ.*); 28, Willoughby, Vermont, *Kennedy* (var. *subel.*); 29, Richmond, Massachusetts, *Robbins* (var. *typ.*); 30, Lake George, New York, *Tuckerman* (var. *typ.*); 31, Minerva, New York, *House*, no, 15,185 (var. *subel.*); 32, Bruce Peninsula, Ontario, *J. Macoun;* 33, Eagle Harbor, Michigan, *Robbins* (var. *subel.*); 34, Heart Lake Creek, Yellowstone Region, *C. Richardson* (var. *subel.*); 35, Georgetown, Colorado (var. *typ.*); 36, Falcon Valley, Washington, *Suksdorf* (var. *typ.*); 37, Krestovskoi Islands, Siberia, *ex Regel* (var. *typ.*).

VII. THE IDENTITIES OF JUNCUS CANADENSIS AND OF J. BREVICAUDATUS

M. L. FERNALD

(Plate 198)

IN 1827 Jacques Gay published *Juncus canadensis* characterized by

> Panicula composita, erecta, plus minusve coarctata vel laxiuscula . . . ; spicis 4–8–16-floris, plus minusve distantibus vel approximatis, echinatis, fuscescentibus. Perigonii foliola lanceolato-linearia, substriata, acutè aristata, interiora sublongiora. Stamina tria, perigonio breviora; . . . . Capsula ellipsoideo-prismatica, triquetra, utrinque leviter attenuata, vix mucronata; . . . Semina utrinque in caudam albidam abeuntia.[1]

Gay's description indicated at least two elements, one with coarctate, the other with lax inflorescence, one with "spikes" 4–8-flowered, the other with more flowers (–15); but both had the perianth-segments acutely aristate, stamens 3, and seeds with a white tail at each end. The two elements were distinguished as

J canadensis. *Gay! ined.*

α. Culmo foliisque tenuibus, paniculâ sublaxâ, spicis 10–15-floris remotiusculis.

β. Culmo foliisque tenuibus, paniculâ coarctatâ, spicis 4–8-floris approximatis.

In 1866, Engelmann took up[2] *Juncus canadensis*, with three varieties: "α. *brevicaudatus* (J. acuminatus, Gray)," "β. *subcaudatus*, Con-

[1] J. Gay in Laharpe, Mon. Jonc. 134 (1827).
[2] Engelm. Trans. St. Louis Acad. ii. 436 (1866).

necticut to Georgia," and "γ. *longicaudatus* (J. paradoxus, Gray), Massachusetts southward to Louisiana, and north-westward to Minnesota"; and under var. "α. *brevicaudatus*" he named two forms, "A. *coarctatus*, Pennsylvania, northward and northwestward" and "B. *patulus*, Pennsylvania to Western New York & Ohio." Engelmann in 1866 gave no descriptions and all his names of that date were *nomina nuda* except *J. canadensis*, α. *brevicaudatus*, which was a renaming of *J. acuminatus* of Gray's Manual of that period (ed. 4), not of Michx., and *J. canadensis* γ. *longicaudatus*, which was a renaming of *J. paradoxus* of Gray's Man. ed. 4, not E. Meyer.

Two years later (1868) Engelmann[1] dropped the properly published name *J. canadensis* α. *brevicaudatus* and the *nomen nudum J. canadensis* α. *brevicaudatus* B. *patulus* of 1866 and recognized four varieties: (1) Var. α. *coarctatus* for the plant formerly called *J. canadensis* α. *brevicaudatus* (including the form "A. *coarctatus*") with the explicit synonymy, "*J. Canadensis*, β. Gay, l. c.; *J. acuminatus*, Torr. N. Y. 2, 327; Gray, l. c. 481; Chap. Fl. 464, et. Auct. Am. plur. non Michx."; (2) Var. β. *brachycephalus*, substituted for the earlier *J. canadensis*, α. *brecivaudatus* B. *patulus* and now for the first time described; (3) Var. γ. *subcaudatus*, now for the first time properly published; and (4) Var. δ. *longecaudatus* (the second syllable altered from the original *gi*), described in detail, with not only the original synonym *J. paradoxus* Gray, not Meyer, but the more significant synonym *J. canadensis* α. Gay. It is perfectly clear, then, that Engelmann, who had studied Gay's specimens, in his final revision identified Gay's *J. canadensis* α. with the plant Gray and others had been calling *J. paradoxus* and which Engelmann now called *J. canadensis*, var. *longicaudatus;* it is also quite as clear that Engelmann's *J. canadensis*, α. *brevicaudatus*, A. *coarctatus* (1866), changed in 1868 to *J. canadensis* var. α. *coarctatus*, was based upon and drew its final name from Gay's "*J. canadensis*, β. . . . paniculâ coarctatâ."

So far as I can find, the first formal taking up of *Juncus canadensis* Gay as standing without qualification for *J. canadensis* α. of Gay or var. *longicaudatus* Engelm. was by Coville in Britton & Brown's Illustrated Flora, i. 394, fig. 955 (1896). Coville's correct interpretation was accepted by me at the time I split off Gay's *J. canadensis* β. or *Engelmann's* var. *brevicaudatus* as a species, *J. brevicaudatus* (Engelm.) Fernald, Rhodora vi. 35 (1904); and it was again accepted by Coville in the second edition of the Illustrated Flora (1913); and

[1] Engelm. l. c. 474 (1868).

still again, by Coville & Blake, in 1918 when they separated off the last remaining of Engelmann's varieties as *J. subcaudatus* (Engelm.) Coville & Blake, Proc. Biol. Soc. Wash. xxxi. 45 (1918). It would thus seem, since Gay's vars. α and β were so definitely identified by Engelmann, who had studied the specimens, and since Coville had definitely taken up as true *J. canadensis* the plant which Engelmann had found to be Gay's var. α, while I had taken up *J. brevicaudatus* for the plant which Engelmann found to be Gay's var. β, that the proper names for these plants had been satisfactorily settled.

But recently Mr. K. K. Mackenzie has expressed[1] his personal dissatisfaction with the identifications others have made of Gay's *Juncus canadensis* α and β. He has secured from Paris photographs of such material of Gay's as could be found. "It will be seen . . . that all of the Canadian and Newfoundland material cited by Gay represents his variety β. They all represent the plant now generally called *Juncus brevicaudatus* (Engelm.) Fernald, as marked by Engelmann.

"The only material cited by Gay unaccounted for above is the Torrey material . . . Investigation at Paris did not result in finding any such material . . ."

Since there is, apparently, no extant material to stand unquestioned for Gay's *J. canadensis* α, Mackenzie's solution is to transfer the name *J. canadensis* to *J. canadensis* β. and he forthwith coins for the plant which Engelmann, Coville and I have identified as *J. canadensis* α the new combination *J. longicaudatus* (Engelm.) Mackenzie. At the same time, although admitting that "the name *J. brevicaudatus* (Engelm.) Fernald . . . can logically be used as in our current manuals," Mackenzie believes it "would be the best course" to interpret *J. brevicaudatus* as based on material of *J. brachycephalus* (Engelm.) Buchenau.

In regard to the last suggestion it should be noted that *J. brevicaudatus* goes directly back to *J. canadensis*, "α. *brevicaudatus* (J. acuminatus, Gray)" of Engelmann (1866); in other words it was *J. acuminatus* of Gray's Manual, ed. 4 (1865). The salient points in Gray's description were "*Stem erect* (10′–15′ high) . . . *panicle with rather slightly spreading branches, bearing few or many* 3–8-*flowered chestnut-colored heads;* sepals lanceolate or linear-lanceolate, very acute, one third or one half the length of the prismatic triangular and abruptly acute pod; *seeds tail-pointed* at both ends. . . . Peat-bogs, and sandy borders of ponds." Mackenzie believes it "would be

[1] Mackenzie, Bull. Torr. Bot. Cl. lvi. 29–32 (1929).

the best course" to interpret *J. canadensis* α. *brevicaudatus* Engelm. (1866) as meaning his forma B. *patulus*, rather than his forma A. *coarctatus*. As already noted, Engelmann in 1868 took up var. *coarctatus* in place of his earlier *J. canadensis* α. *brevicaudatus* (and its forma A. *coarctatus*), while he substituted for α. *brevicaudatus* B. *patulus* of 1866 the new name var. *brachycephalus*, which is the basis of *J. brachycephalus* (Engelm.) Buchenau. Engelmann correctly described the latter as having "culms 1½–2½ feet high; panicles effuse, with spreading branches; sepals mostly obtuse; capsules obtusish and mucronate, short-exserted (caulibus elatioribus (1½–2½ pedalibus) . . . ; paniculae majoris effusae ramis patulis; . . . sepalis plerumque obtusis; . . . capsula . . . obtusiuscula mucronata breviter exserta)." How different was Gray's description of his *J. acuminatus* upon which alone the original *J. canadensis* α. *brevicaudatus* Engelm. (1866) rests: "*Stem erect* (10′–15′ high) . . . ; *panicle with rather slightly spreading branches* . . . ; sepals . . . very acute, one third or one half the length of the prismatic triangular and abruptly acute pod." Gray's description in English was closely paralleled by Engelmann's description in Latin in 1868 of his var. *coarctatus* which he was then substituting for his earlier var. *brevicaudatus*: "(½–1½ pedalibus) erectis; paniculae minoris coarctatae ramis erectis; . . . sepalis acutis seu raro obtusiusculis; . . . capsula . . . acutata longius exserta." Neither Engelmann, Gray, Coville, Buchenau nor any one else who understood the genus had any thought of confusing *J. acuminatus* Gray, not Michx. with *J. brachycephalus*. There are only a few specimens of this group in the Gray Herbarium dating back to 1865 and thus showing what Gray was calling *J. acuminatus* just prior to Engelmann's publication of *J. canadensis*, "α. *brevicaudatus* (J. acuminatus, Gray)." In *J. brachycephalus* there are 4 specimens: from Erie Co., New York, *A. Gray*, without an original identification but marked by John Carey "*J. acuminatus?*"; from Penn Yan, New York, *Sartwell* and from Dexter, New York, *Vasey*, the Sartwell specimen without name, the Vasey one originally called *J. paradoxus*, changed to *J. pelocarpus?*, and both marked by Carey "*J. acuminatus? capitulis parvis*"; a sheet from Jefferson Co., New York, *Vasey*, labeled *J. articulatus;* all of the specimens relabeled by Engelmann *J. canadensis* β. *brachycephalus*. Of *J. brevicaudatus* (Engelm.) Fern. or *J. coarctatus* (Engelm.) Buchenau there are likewise 4 of these older specimens: Essex Co., Massachusetts, *Oakes*, without name except in Engelmann's hand

"*J. canadensis* Gay, α. *brevicaudatus*, γ. *coarctatus*, G. E. 1866," the second name with a later pen-line through it; White Mts., New Hampshire, *Gray*, similarly without name on original label but marked by Engelmann as above; and two numbers (3 and 4) sent by Vasey from Dexter, New York as "*Juncus accuminatus*" and so accepted by Gray who made memoranda as to the source of the specimens and corrections of Vasey's unfortunate spelling; and these, like the others were marked by Engelmann *J. canadensis* var. *coarctatus*. It is thus clear that the only plants Gray had before him which bore the unquestioned name *J. acuminatus* were specimens which Engelmann at first called *J. canadensis*, var. *brevicaudatus*, forma *coarctatus*, later var. *coarctatus*. That *J. acuminatus* of Gray, consequently *J. canadensis* α. *brevicaudatus* Engelm., therefore *J. brevicaudatus* (Engelm.) Fernald, is the plant Fernald meant when he transferred the name there can be no serious question.

As to Mackenzie's other contention, that in the absence of any identifiable type of Gay's *J, canadensis* α, the name *J. canadensis* should be used for his var. β. because the first specimen mentioned by Gay happens to belong to that plant, of course the International Rules of Nomenclature provide that "When a species or subdivision of a species is divided into two or more groups of the same nature, if one of the two forms was distinguished or described earlier than the other, the name is retained for that form" (Art. 47). It is, consequently, logical to accept the "alpha variety" as the type of a complex species; and when the var. β. was taken out as the coördinate species, *J. brevicaudatus*, naturally var. α was interpreted as *J. canadensis*.

Even though no extant specimen of Gay's *J. canadensis*, var. α can be found, Gay (or Laharpe) furnished a very vivid comparative note which Mackenzie did not quote. After the description of *J. canadensis* occurs this comment: "La variété α ressemble au *J. lampocarpos* γ, tandis que la variété β a le port du *J. ustulatus*." *J. lampocarpus* is the plant we call *J. articulatus* L. and *J. lampocarpus* γ of Laharpe is the extreme with "Spicis paucis, multifloris, densis, culmo foliisque duris,"[1] i. e. *J. lampocarpus*, var. *macrocephalus* (Viv.) Döll. An inflorescence of this plant, which Laharpe stated that *J. canadensis* var. α of Gay resembles, is shown in PLATE 198, FIG. 1, from a specimen collected in Hyères (*Raine*), and beside it (FIG. 2) is a panicle of the American plant which Engelmann, Coville and I have

[1] Laharpe, Mon. Jonc. 125 (1827).

identified as Gay's *J. canadensis*, var. α. In the absence of a type-specimen, Laharpe's note of the resemblance of the two is certainly pretty conclusive and little good can come by replacing this well-grounded interpretation by a new guess which at best simply shifts the names without adding anything of finality to the solution.

Juncus ustulatus Hoppe is treated by Buchenau, Rouy and other competent European students as one of the varieties of *J. alpinus* Vill. A characteristic inflorescence of this variety of *J. alpinus* (*J. ustulatus*) is shown in FIG. 3 (*Braun-Blanquet*, Fl. Raet. Exsicc. no. 318) and beside it a typical inflorescence of *J. brevicaudatus* (Engelm.) Fernald as FIG. 4 (Bathurst, New Brunswick, *S. F. Blake*, no. 5440). The pertinence of the original statement that Gay's *J. canadensis* β has the aspect of *J. ustulatus* is apparent. It should be clear, then, that when Engelmann stated that his *J. canadensis*, var. *brevicaudatus*, later called by him var. *coarctatus*, was Gay's *J. canadensis*, var. β, he had positive grounds for his identification and that when he originally based var. *brevicaudatus* upon Gray's *J. acuminatus* he was correctly associating the latter with *J. canadensis*, var. α of Gay. There is, then, no reasonable justification for shifting *J. brevicaudatus* to the synonymy of *J. brachycephalus*, as supposed by Mackenzie.

EXPLANATION OF PLATE 198

(All figures × 1)

Panicles of (FIG. 1) JUNCUS LAMPOCARPUS γ Laharpe (var. MACROCEPHALUS (Viv.) Döll) from La Plage, Hyères, France, *F. Raine;* (FIG. 2) J. CANADENSIS J. Gay from Chilmark, Massachusetts, *F. C. Seymour*, no. 1147; (FIG. 3) J. USTULATUS Hoppe (J. ALPINUS, var. MUCRONIFLORUS (Clairv.) Aschers. & Graebn.) from the Central Alps, *Braun-Blanquet*, Fl. Raet. Exsicc. no. 318; (FIG. 4) J. BREVICAUDATUS (Engelm.) Fernald from Bathurst, New Brunswick, *S. F. Blake*, no. 5440.

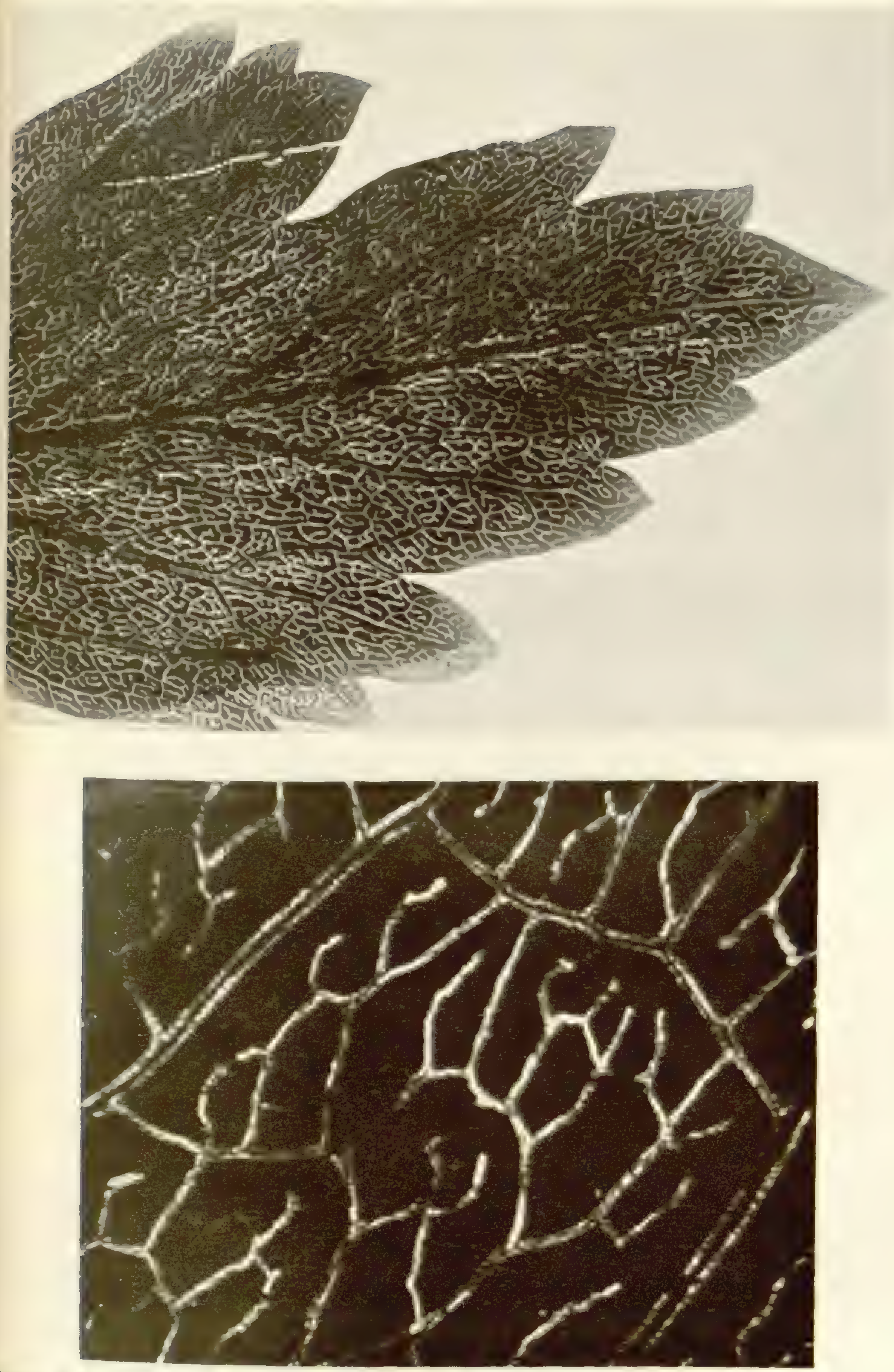

Photo by A. N. Steward.

VENATION OF BASAL LEAFLET OF LIGUSTICUM SCOTHICUM
(UPPER FIG. × 3, LOWER FIG. × 20)

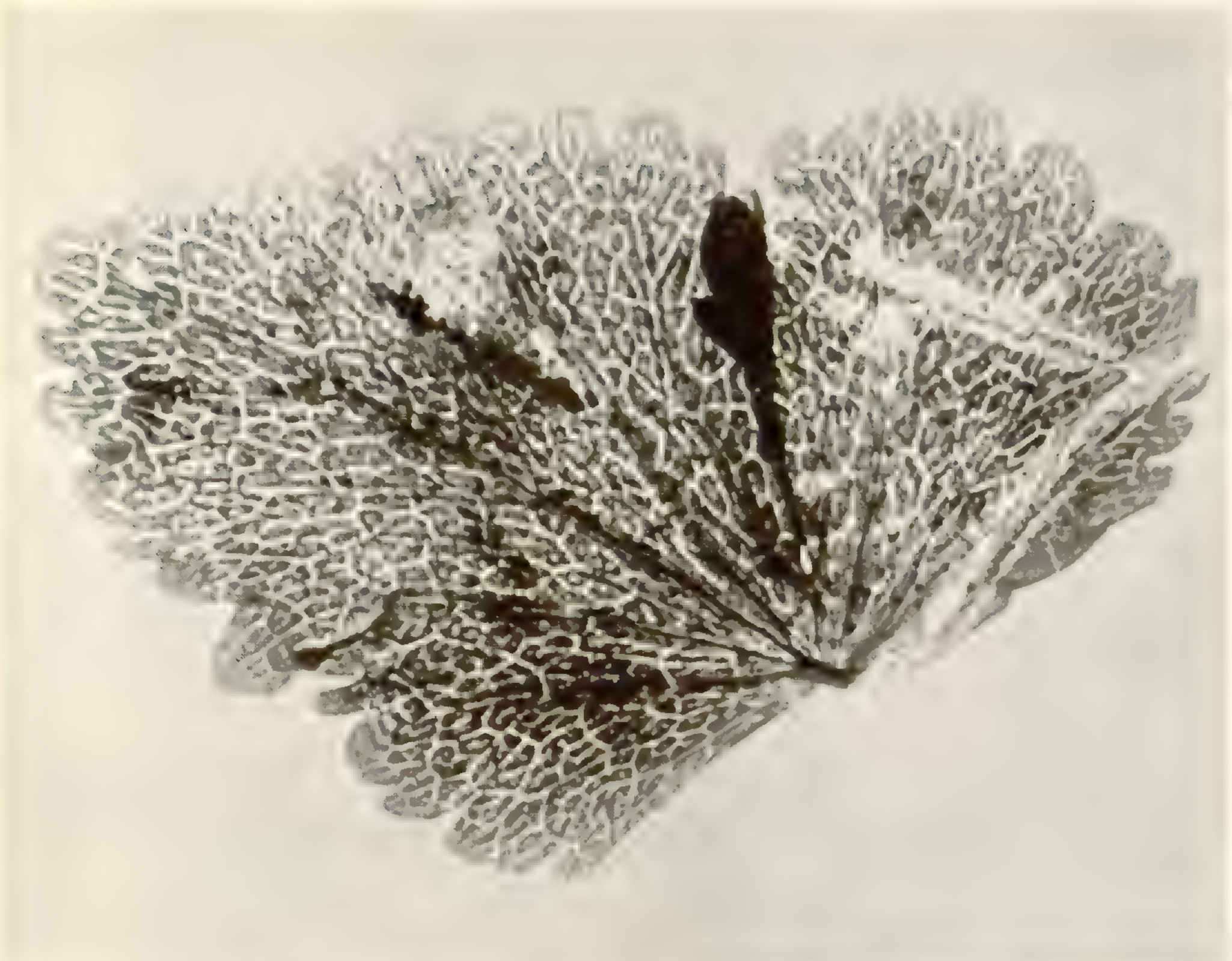

Photo. by A. N. Steward.

VENATION OF BASAL LEAFLET OF LIGUSTICUM HULTENII
(UPPER FIG. × 3, LOWER FIG. × 20)

G. L. S. del.

Calamagrostis canadensis (fig. 1), var. robusta (fig. 2), var. Langsdorfi (figs. 3a, 3b and 3c), var. arcta (figs. 5a and 5b); C. Scribneri (fig. 4); C. inexpansa (figs. 6a and 6b); var. novae-angliae (figs. 7a, 7b and 7c); C. hyperborea (fig. 8); C. lapponica, var. brevipilis (fig. 9); C. labradorica (fig. 10); C. neglecta (figs. 11a and 11b).

Photo. by H. M. Raup and A. N. Steward.

Bromus: figs. 1–3, B. Dudleyi; fig. 4, B. ciliatus, var. genuinus; fig. 5, B. ciliatus, var. intonsus; fig. 6, B. Porteri; fig. 7, B. Kalmii; fig. 8, B. ramosus; all × 1¾.

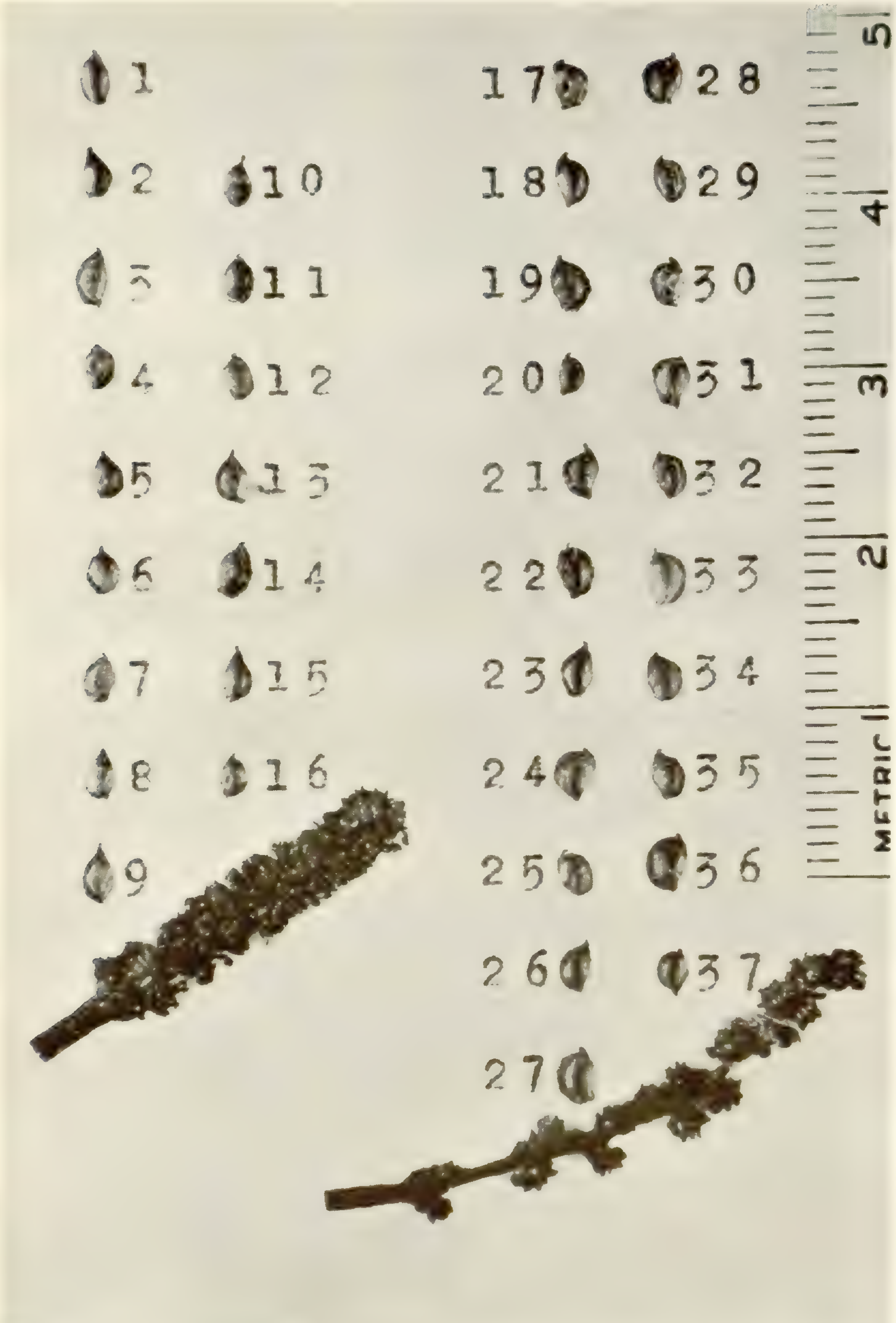

Photo. by H. M. Raup and A. N. Steward.

POTAMOGETON ALPINUS at left, × 2; P. MICROSTACHYS at right, × 2.

Photo. by H. M. Raup.

JUNCUS: FIG. 1, J. LAMPOCARPUS, var. MACROCEPHALUS; FIG. 2, J. CANADENSIS; FIG. 3, J. ALPINUS, var. MUCRONIFLORUS (J. USTULATUS); FIG. 4, J. BREVICAUDATUS; all × 1.

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LXXXVIII.

ISSUED APR 17 1930

THE POLYGONEAE OF EASTERN ASIA.

By Albert N. Steward.

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THE POLYGONEAE OF EASTERN ASIA.

I. INTRODUCTION.

During five years of botanical work in China the writer felt keenly the lack of literature to assist in the satisfactory study of Chinese plants. This need was most often experienced in connection with certain large groups of closely related species within which it was difficult if not impossible to distinguish the component parts. Among these the genus *Polygonum* was of outstanding difficulty and was notorious in the writer's taxonomic experience because of the large proportion of unnamed specimens encountered in herbaria and the uncertainity of the determinations of those which were named. Dr. E. D. Merrill, who has had wide experience in the identification of plants from that region, assured the writer that *Polygonum* was, in his opinion, one of the groups most troublesome to the systematic botanist in temperate and subtropical eastern Asia. From such personal experience, and in anticipation of opportunities to come, the writer prepared a keyed enumeration of the Chinese species of *Polygonum* during the first year of his graduate study at the Gray Herbarium. From this early study it was apparent that the very considerable mass of literature published on this group at various times and by numerous authors was greatly in need of correlation. Furthermore, it appeared necessary to carry on studies through which the variable and complex species of this assemblage could be contrasted with and distinguished from one another. To introduce a degree of order where there has been great confusion resulting from unrelated efforts, rather than to record any considerable number of species and varieties new to science, has been the chief objective of this study.

The *Polygoneae*, that tribe of the *Polygonaceae* in which there are ocreae and usually a 4- or 5-cleft perianth, consist of the great genus *Polygonum* and of several small and doubtfully distinct segregates. Dammer (in Engler & Prantl, Pflanzenfam. III. 1a. 25) considered this tribe to be composed of four genera: *Oxygonum*, *Polygonum*, *Fagopyrum* and *Polygonella*. The first and the last named are not found within the area of this study. *Fagopyrum* has been here treated as a section of *Polygonum*, and *Tovara* has been separated from *Polygonum* as given by Dammer. He placed *Koenigia* in the tribe *Eriogoneae* of the subfamily *Rumicoideae*, which is separated from the remainder of the family by having cyclic flowers (op. cit. p. 8). However, Engler and Gilg (Syllabus der Pflanzenfam. 1924 p. 194) have placed *Koenigia* in the subtribe *Polygoninae*, together with *Polygonum* and *Fagopyrum*.

The most important work on this group was done by Professor Karl Friederich Meisner of the University of Basel, who, over a period of forty years, studied the whole family of the *Polygonaceae* and produced a series of works not only classical for the group but standard for the study of its components. His earliest work of importance in this review was his Monographiae Generis Polygoni Prodromus (1826) and was, as the title indicates, a general study based on material from all parts of the world. Meisner prepared the text on *Polygoneae* appearing in Wallich's Plantae Asiaticae Rariores (1832), and the *Polygonaceae* of De Candolle's Prodromus (1856) were done by him. Meisner's latest work of interest in this study was an enumeration of the *Polygonaceae* of the Dutch East Indies and Japan, appearing in the second volume of Miquel's Annales Musei Botanici Lugduno-Batavi (1865–66). Meisner's work, especially that of his Monograph and that in DeCandolle's Prodromus was sound and well done. In the few cases where the present writer has departed from his usage, the decision reached has been largely due to the availability of additional material for study rather than to a difference in evaluation of the characters used by Meisner, who should properly be considered as the monographer of the group.

The works of three more recent botanists have also been much consulted during the studies here recorded. The treatment of *Polygonum* and *Fagopyrum* by J. D. Hooker in his Flora of British India (1886) and the later work based upon it, A Census of the Indian Polygonums (1903) by A. T. Gage, have been very helpful in reaching an understanding of the species from British India and the Himalayan region. The very recent study of Die Polygonaceen Niederlaendisch-Ostindiens (1927) by B. H. Danser of the Buitenzorg Herbarium has been an exceedingly valuable aid to interpretation of the species from the East Indian Islands, the Philippines and Malaya.

The approach to the problem of relationships and classification in this group has been by means of keys. The paper was begun as an enumeration of the Chinese species of *Polygonum*, with keys; and only those species were admitted which could with reasonable clearness be separated from all others. As the work progressed the principle has been constantly enforced. More careful study of the descriptions, a better understanding of the characters of diagnostic importance and the examination of additional material have caused the removal of certain names from synonymy, and made clear their place in the outline as valid species. Without doubt further study and the collection of more material will clarify some names which have here been placed as synonyms.

At least three keys, worthy of note, to species of the genus *Polygonum* in certain parts of the area covered by this study have been prepared by still other botanists. Franchet and Savatier gave a Conspectus Polygonorum Florae Japonicae in the second volume of their Enumeratio Plantarum (1879). Courchet gave a key as well as descriptions to the species known from Indo-China in the fifth volume of Lecomte's Flore Générale de l'Indo-Chine (1910). And Léveillé, though many of his descriptions of species are a source of unending trouble, should at least be given credit for having written a Clef des Polygonum de Chine et de Corée which appears in the Bulletin de la Société Botanique de France (1910).

Many authors of specific descriptions in this group have failed to distinguish their plants adequately, if at all, from closely related ones. The names of such plants were placed in synonymy pending more conclusive evidence by which to determine their identity, or in case this was not possible, they have been placed in a list of named but unclassified plants at the end of the systematic section of this paper. In other cases the distinctions are clear, but the study of a quantity of material has shown that there are in existence forms intermediate between two supposed species. In such cases one has been reduced to synonymy, or, if there appeared to be reasonable evidence of geographical segregation, a variety has been proposed in place of the later specific name.

An attempt has been made to apply this principle also to the separation of genera. Such variations and intermediate forms occur that difficulty has been found in stating characters to separate, even sectionally, some of the groups so given under *Polygonum*. Hence it has been thought desirable to treat as distinct genera only those groups which could be clearly and sharply separated on characters of fundamental importance.

After the revision here presented was nearly completed the writer learned that Professor Gunnar Samuelsson, of Stockholm, was engaged in the study of Chinese *Polygonaceae*. Happily, the results of his work with Dr. Handel-Mazetti's recent collections in southwestern China, including descriptions of several new species, have just been published and it has been possible to take account of them in this paper. Since Professor Samuelsson has examined the material of *Polygonum* in large European collections which were not available to the writer, his opinions have been carefully considered. There has not been, however, any considerable duplication of effort, since the present paper embraces a much more extensive area than was covered by Professor Samuelsson's studies of Chinese *Polygonum*.

Also late in this work the writer found that Professor T. Nakai, of Tokyo, had recently published in Japanese a paper entitled A New Classification of Linnaean Polygonum (Rigakkai 1926) setting forth the basis for his treatment as genera of several groups which had previously been considered to be of sectional rank. However, in correspondence Professor Nakai has kindly sent a translation of his conspectus of genera, and although the writer has not been able to agree to some of the separations this interesting key is here reproduced (with Professor Nakai's permission) in order that botanists unfamiliar with the Japanese may know the basis for these separations.

CONSPECTUS GENERUM.

1. Embryo centralis i. e. in medio albuminis positus. Cotyledones conduplicati. Albumen farinosum. Petioli inarticulati. Flores spicati vel paniculati. Styli 3 liberi elongati vel breves ..... *Fagopyrum.*
   Embryo lateralis. Cotyledones plani ..... 2.
2. Pollen ellipsoideum longitudine trisulcatum ..... 3.
   Pollen rotundum foveolatum ..... 8.
3. Cotyledones incumbentes (0||). Petioli articulati. Flores axillares. Styli 3 brevissimi. Albumen induratum ..... *Polygonum.*
   Cotyledones accumbentes (0=) ..... 4.
4. Petioli articulati. Tres lobi perigonii alati. Rhizoma longe repens ramosum incrassatum. Styli 3. Albumen induratum ..... 5.
   Petioli inarticulati. Monoecius ..... 6.
5. Dioicus. Stigma fimbriatum. Caulis erectus vel ascendens .. *Reynoutria.*
   Monoecius. Stigma subpeltatum. Caulis volubilis ..... *Pleuropterus.*
6. Albumen induratum. Herba annua. Caulis volubilis. Inflorescentia axillaris vel terminalibus. Flores glomerati vel spicati. Styli 3 breves ..... *Bilderdykia.*
   Albumen farinosum. Radix perennis. Caulis erectus ..... 7.
7. Caulis simplex cum foliis radicalibus suffultus. Inflorescentia spicata. Flores densi. Styli 3 elongati ..... *Bistorta.*
   Caulis ramosus. Folia radicalia si adsunt sub anthesin emarcida. Styli 1 trifidi ..... *Pleuropteropyrum.*
8. Cotyledones incumbentes (0||). Albumen farinosum. Inflorescentia spicata. Styli 1 bifidi ..... *Amblygonon.*
   Cotyledones accumbentes (0=). Albumen induratum ..... 9.
9. Styli 2 rigidi apice uncinati. Radix tuberosa lignosa. Spica flagellatim elongata ..... *Tovara.*
   Styli 1 bifidi vel trifidi. Stigma punctatum vel capitatum nunquam induratum. Radix fibrosa annua vel cum rhizomate biennis ..... *Persicaria.*

The *Polygoneae* are mostly herbaceous, though several more or less shrubby species are included among those from the Himalayan region. The stem habit varies greatly among the different species but the leaves are uniformly alternate. The leaf blades are simple and usually pinnately veined and have entire margins. However, the blades are lyrate-pinnatifid in *P. runcinatum* and palmately cleft in *P. palmatum.* The base of the petiole, or attachment of the blade in case it is sessile,

is enclosed by a usually membranous sheath called an ocrea, which may be conspicuously nerved and may have the nerves protruding into more or less elongated cilia. The flowers are borne in fascicles each of which is subtended by a small sheath, often somewhat bract-like, called an ocreola. The fascicles are borne in the axils of the leaves in *Koenigia* and in section *Avicularia* of *Polygonum*, but in a large part of the remaining species they are in more or less congested panicles. These are spike-like and are called spikes in sections *Bistorta* and *Persicaria* of *Polygonum*, but the arrangement is in head-like panicles in section *Cephalophilon* and it is cymose to pyramidal in sections *Aconogonon* and *Fagopyrum*. The flowers are apetalous but have a 3–6-lobed or -cleft perianth which is white, pink or occasionally red, and is sometimes accrescent in fruit. The fruit is a lenticular or triangular achene with deciduous styles and stigmas, except in *Tovara* which is separated because of its persistent 2-cleft style with hooked tips.

The group is an exceedingly variable one and no characters have been found which are wholly reliable in every case. However, there are certain features which are of considerable diagnostic importance.

(1) The achenes may be either triangular or lenticular. Both forms do not usually occur in the same species, but in some parts of section *Persicaria* of *Polygonum*, e. g. in *P. Hydropiper*, both have been observed in the same fascicle. The surfaces of the achenes are often striate or pitted and their length, in relation to that of the perianth, is often a characteristic feature.

(2) The number of the stamens is quite variable, but pubescent filaments as contrasted with the usual glabrous ones are used in section *Tiniaria* of *Polygonum* to separate *P. baldschuanicum* and *P. Auberti* from *P. multiflorum* and the remaining species of the section.

(3) In section *Aconogonon* there are two species, *P. tibeticum* and *P. paniculatum* in which the perianth bears a disc which is definitely lobed between the filament bases. *P. Hydropiper* and two or three other species of section *Persicaria* have the perianth glandular-dotted.

(4) Either pubescence or a ciliate margin on the ocreola frequently becomes a character of real value in separating related species.

(5) The form of the ocreae, whether tubular, obliquely cut at the top, or split into parts is often a means of separating groups or sections of species in *Polygonum*. The presence or absence, coarseness, or length of cilia at the top of the ocreae are usually characters more dependable than would be expected in leaf structures.

(6) The form of the "spike" or panicle composing the inflorescence is often of importance and may be stated in general terms as charac-

teristic of whole sections in *Polygonum*. For example, section *Bistorta* has cylindrical "spikes" while in section *Cephalophilon* they are head-like and tend to approach a spherical form.

(7) Leaves have, perhaps, been over-used in descriptive studies previously made in this group. It is, however, unquestionably true that certain sections of *Polygonum* may be loosely characterized as to leaf form. We may, for instance, say that in section *Persicaria* the leaf blades are lanceolate, while in section *Fagopyrum* they are triangular.

The following brief bibliography will be helpful to the student of the group or any of its components within the area covered by the present study. For convenience the items are arranged alphabetically by the names of the authors.

Babington, C. C. Descriptions of those species of Polygonum and Fagopyrum which are contained in the Indian Herbarium of J. Forbes Royle. Trans. Linn. Soc. xviii. 93–119 (1838).

Candolle, A. De. Prodromus Systematis Naturalis Regni Vegetabilis. xiv. Polygonaceae, pp. 1–186 (auctor Meisner). Parisiis. 1856.

Courchet, L. (Key to Species of Polygonum, and Descriptions). Lecomte, Fl. Gén. Ind.-Chine v. 21–41 (1910).

Danser, B. H. De Polygonum-soorten der theetuinen op Java. Mededeelingen van het Proefstation voor Thee, No. XCVIII. pp. 19 & 9 plates (1926).

———. Die systematiche Stellung der Houttuyn'chen Gattung Reynoutria und Truellum. Bul. Jard. Bot. Buit. Ser. III. viii. 25–31 & 2 figures (1926).

———. Die Polygonaceen Niederlaendisch-Ostindiens. Op. cit. 117–261 and 17 figures (1927).

Franchet, A. et Savatier, L. Conspectus Polygonorum Florae Japonicae. Enum. Plant. Jap. ii. 477–481 (1879).

Gage, A. T. A Census of the Indian Polygonums. Rec. Bot. Surv. Ind. ii. 371–452 and ii. (1903).

Geitler, L. Zur Morphologie der Bluten von Polygonum. Oster. Bot. Zeitschr. lxxviii. 229–241 and 6 figures (1929).

Gross, H. Polygonaceae nonullae novae. Engl. Bot. Jahrb. xlix. 340–348 (1913).

———. Remarques sur les Polygonées de l'Asie Orientale Bul. Géog. Bot. le Mans xxiii. 7–32 (1913).

Hance, H. F. A new Polygonum, of the section Pleuropterus [P. Forbesii]. Journ. Bot. 1883, p. 100.

Hooker, J. D. The Flora of British India. v. Polygonaceae, pp. 22–61 (1886). London. Reeve & Co.

Léveillé. Clef des Polygonum de Chine et de Corée. Bull. Soc. Bot. France lvii. 443–450 (1910).

Léveillé & Vaniot, E. Enumeration des Plantes du Kouy-Tchéou Plantae Bodinierianae (Suite). Genre Polygonum (1). Bul. de l'Acad. Int. de Géog. Bot. xi. 338–344 (1902).

Meisner, C. F. Monographiae Generis Polygoni Prodromus. Genevae. pp. 117 and 7 plates (1826).

———. Synopsis Polygonearum, quarum specimina existant in Herbario amplissimae Procurationis Britannicae Indie Orientalis, nunc Societatis Linneanae Londinensis. Wall. Pl. As. Rar. iii. 53–65 (1832).

———. Polygonaceae in India Batava et Japonia. Ann Mus. Lugd.-Bat. ii. 55–65 (1865–66).
———. Notice sur Les Polygonées, Les Thymélées et Les Laurinées recoltées pendant les années 1855–57 dans haute Asie, par MM. de Schlagintweit. Ann. Sci. Nat. Bot. V. vi. 334–360 (1866).
Nakai, T. Polygonaceae Koreanae. Journ. Col. Sci. Tokyo xxiii. Art. 11, pp. 28 and 1 plate (1908).
———. A New Classification of Linnaean Polygonum. Rigakkai xxiv. 289–301 (1926)—In Japanese.
Ohki, K. Species Novae Polygonacearum Formosae. Bot. Mag. Tokyo xxxix. 259–264 (1925).
———. Polygonaceae of the Island Iki. Op. cit. xl. 48–58 (1926).
Petrov, V. A. De Bistortella, subgenre novo generis Bistorta Adans. Bul. Jard. Bot. URSS. xxvii. 220–223 and 1 plate (1928).
Schuster, J. Polygonaceen-Studien. VI. Polygonaceen aus China. Bul. Herb. Boiss. II. viii. 711–713 (1908).
Scribner, F. Lamson. Giant Knotweed, or Sachaline (P. sachalinense). U. S. D. A. Bot. Circ. 5. pp. 4 and 3 figures (1895).
Stanford, E. E. The Inflorescence and Flower-form in Polygonum, subgenus Persicaria. Rhodora xxvii. 41–47 (1925).
———. Possibilities of Hybridism as a Cause of Variation in Polygonum. Op. cit. 81–89 (1925).
———. The Amphibious Group of Polygonum, subgenus Persicaria. Op. cit. 109–112, 125–130, 146–152, 156–166 (1925).

For essential economy of space, titles very frequently used in the course of the work have been cut down from the conventional abbreviations to even shorter forms or initials, as follows:—

A. H. P. . . . Act. Hort. Petrop.
B. G. B. . . . Bul. Géogr. Bot.
B. M. T. . . . Bot. Mag. Tokyo.
C. . . . . Courchet in Lecomte, Fl. Ind.-Chin. v. (1910).
D. . . . . D. Don, Prodr. Fl. Nep. (1825).
Dan. . . . . Danser in Bul. Jard. Bot. Buit. III. viii. (1927).
F. & H. . . . . Forbes & Hemsl. Ind. Fl. Sin. in Journ. Linn. Soc. xxvi. No. 176 (1891).
G. . . . . Gage in Rec. Bot. Surv. Ind. ii. (1903).
H. . . . . Hook. f. Fl. Br. Ind. v. (1886).
Led. . . . . Ledeb. Fl. Ross. iii. (1846–51).
M. . . . . Meisn. Monogr. Polygon. (1826).
M. in DC. . . . Meisn. in DC. Prodr. xiv. (1856).
M. in Miq. . . Meisn. in Miq. Ann. Mus. Lugd.-Bot. ii. (1865–66).
M. in W. . . . Meisn. in Wall. Pl. As. Rar. iii. (1832).
Mat. . . . . Matsum. Ind. Pl. Jap. II. ii. (1912).
Mer. . . . . Merr. Enum. Philipp. Pl. ii. (1923).
N. . . . . Nakai in Journ. Col. Sci. Tokyo xxiii. Art. 11 (1908).
S. . . . . Samuelsson in Handel-Mazzetti, Symbolae Sinicae vii. (1929).
W. . . . . Wall. Cat. (1828).

In addition to the material in the Gray Herbarium, the writer has been able to examine the collections of *Polygonum* from eastern Asia found in the herbarium of the University of California, the United States National Herbarium, also the herbaria of Professor Oakes Ames, the Missouri Botanical Garden, the Arnold Arboretum, the New York Botanical Garden (including the Meisner Herbarium, the Torrey Herbarium and the Herbarium of Columbia College) and the Bureau of Science, Manila, which have been loaned to the Gray Herbarium for use in this study. The writer desires here to express sincere appreciation of the continuous and helpful interest in every detail of the work shown by Professor B. L. Robinson under whose guidance the study has been carried forward. Acknowledgment is gladly made of various courtesies extended by Dr. E. D. Merrill, Dr. J. N. Greenman, Mr. A. Rehder, Dr. J. K. Small, Dr. E. Quisumbing, Professor G. Samuelsson, Professor T. Nakai, the staff of the Gray Herbarium and several others who have contributed to the progress of this paper.

In the citation of specimens examined the names of the herbaria referred to most frequently have been abbreviated as follows:

AA.....Herbarium of the Arnold Arboretum.
BS.....Herbarium of the Bureau of Science, Manila.
C.....Herbarium of Columbia College (at New York Bot. Gard.).
CCC.....Herbarium of Canton Christian College (Lingnaan University).
FCU.....Herbarium of Fukien Christian University
GH.....Gray Herbarium.
HH.....Hongkong Herbarium.
M.....Meisner Herbarium (at New York Bot. Gard.).
MBG....Herbarium of the Missouri Botanical Garden
NY.....Herbarium of the New York Botanical Garden.
T.....Torrey Herbarium (at New York Bot. Gard.).
UC.....Herbarium of the University of California.
UN.....Herbarium of the University of Nanking.
US.....United States National Herbarium.

Since the *Polygoneae* are not of outstanding economic importance, the following brief notes will serve to indicate the principal uses which have been made of these species and of products derived from them.

(1) The most important plants of the group, economically, are *Polygonum Fagopyrum* (Common Buckwheat) and *P. tataricum* (Kangre Buckwheat). The seeds of these species are a source of starchy food in the Himalayan region, Tibet and Manchuria, where they are native and are also often found in cultivation. Buckwheat is of com-

paratively recent origin as a cultivated plant in the West, being unknown to the Greeks and Romans, and only introduced into Europe early in the 16th century. It is perhaps most commonly used in Russia. The nutritive value of this "grain" is inferior to that of Wheat. The flowers of Buckwheat are often a valuable source of honey and the plant is sometimes used as a potherb. *P. orientale* is used as a potherb in Japan whence it is thought to have been introduced by the Portuguese. *P. japonicum*, *P. cuspidatum* and *P. sachalinense* (Sacaline) are used in a similar manner. The rootstock of *P. Bistorta* (Bistort or Adderswort), which though starchy contains about 20% of tannin, has been used for food in Iceland, and elsewhere in times of famine.

(2) All the species, except the last, mentioned in the preceding paragraph, and also *Polygonum aviculare* (Knot-grass) and *P. Persicaria* (Lady's Thumb) are reported to be used for fodder or as green forage. Also, the "grain" of the Buckwheats is used as food for poultry.

(3) Several species of *Polygonum* have minor medicinal uses. *P. Hydropiper* (Water Pepper or Smart Weed) is noted for its acrid juice due to a principle called polygonic acid. It also contains some tannin. A Japanese variety is cultivated for its acrid leaves. A decoction made from the plant has been found to keep flies from wounds, e. g. in cattle. The curled rhizome of *P. Bistorta* has been used medicinally in Europe, but perhaps its main virtue is the snake-like form of the rhizome which, under the Doctrine of Signatures, gave rise to the name Snakeroot. The names of *P. aviculare*, *P. cynosum*, *P. Fagopyrum*, *P. glabrum*, *P. orientale* and *P. senticosum* have also been given among those of medicinal plants.

(4) *Polygonum tinctorium* is an important source of indigo in the Orient and is used in dyeing cotton cloth. Other species are reported to yield yellow dyestuffs.

(5) *Polygonum Convolvulus* (Black Bindweed) is well known as a garden weed and *P. sachalinense* as well as *P. cuspidatum* are often difficult to eradicate where they have escaped from cultivation in America.

(6) Among the species planted because of their ornamental qualities the following are outstanding: *Polygonum sachalinense* (Sacaline), *P. orientale* (Prince's Feather), *P. cuspidatum*, *P. multiflorum*, *P. Auberti* and *P. baldschuanicum*.

The present study began with a key and enumeration prepared in 1926 covering only the Chinese species of *Polygonum*. As the project grew, the field was expanded to include British India, northern con-

tinental eastern Asia, Japan, Farther India, the Philippines and finally the East Indian Islands. The following order of these major geographical divisions has been adopted in citing specimens: British India, Afghanistan, Central Asia, Siberia, China, Korea, Japan, Formosa, Farther India, the Philippines and the East Indian Islands. Eurasian species known to occur only west of the meridian 60° east from Greenwich have been excluded from consideration in this paper.

The present study has been systematic rather than geographic, but a few groups of species present ranges of such a character that it seems worth while to state them here.

(1) *Tovara virginiana* is one of many plants limited in range to eastern North America and eastern Asia. Sufficient grounds have been found for separation of the American plant from those of Asia, and three Asiatic varieties have been recognized.

(2) The occurrence of the circumboreal *Koenigia islandica* southward in the highlands of eastern and central-eastern Asia to the Himalayas is worthy of note.

(3) In south-central Eurasia there has developed, perhaps in response to the extremely xerophytic conditions, a group of shrubs in section *Aviculuria* of *Polygonum*, with reduced leaves and often with spiny stems, which is represented in the present study by *P. biaristatum* from Afghanistan.

(4) There are also woody species from sections *Bistorta* and *Acomogonon* which appear to be restricted to the alpine regions of the Himalayas, Tibet and southwestern China, e. g. *P. emodi* and *P. campanulatum*.

(5) Japan, Korea and eastern China have in common a group of species such as *P. japonicum*, *P. perfoliatum* and *P. Weyrichii*.

(6) Still another group has a range from subtropical eastern Asia southward to the East Indian Islands. *P. chinense* and *P. paniculatum* represent this group.

(7) Some representatives of the northern flora of continental Eurasia occur in the northern part of the area covered by this study, e. g. *P. divaricatum* and *P. sibiricum*.

(8) Such species as *P. aviculare* and *P. lapathifolium*, being widely distributed in the northern hemisphere, are, of course, common in eastern Asia.

II. SYSTEMATIC TREATMENT.

Key to Genera.

Style persistent, 2-parted to the base, recurved and hooked at the tips: inflorescence leafless, of slender spike-like panicles the ultimate branches of which are 15–35 cm. long; fascicles 1–3-flowered, scattered at intervals of from 5–20 mm. ..... I. Tovara.

Style neither persistent nor hooked at the tips: inflorescence not spicate except in sections *Bistorta* and *Persicaria* of *Polygonum* where the panicles are dense, spike-like and usually not over 10 cm. long.

Perianth 3-cleft: stamens 1–3: plant a slender annual 2–15 cm. high ..... II. Koenigia.

Perianth 4–6-cleft: stamens 2–8: herbs or shrubs ..... III. Polygonum.

TOVARA Adans.

Erect herbs, often from irregularly knotted rhizomes. Stems simple or branching above. Leaves short-petiolate from the bases of cylindrical ocreae; blades obovate to lanceolate, tapering to the petiole, acute or acuminate, usually more or less pubescent. Ocreae membranous, glabrous or pubescent, the lower ones ruptured by the expanding nodes. Inflorescence of slender terminal or axillary spikes. Ocreolae obliquely tubular, ciliate, 1–3-flowered. Perianth 4-parted, persistent. Style 2-parted to the base, deflexed and hooked at the tips, persistent. Achene lenticular, light brown, included at maturity by the perianth. [Adans. Fam. d. Pl. ii. 276 (1763). *Polygonum* § *Tovara* (Adans.) Benth. & Hook. f. Gen. Pl. iii. 98 (1880).]

Several genera have been separated from the broad concept of *Polygonum* under which that genus is made to include practically the whole of the tribe *Polygoneae*. These separations have often been based upon vegetative characters which are found to vary greatly in this group. Among these segregates *Tovara* stands unique in having constant differences in the inflorescence and reproductive organs, distinctions which are certainly of generic value.

1. **Tovara virginiana** (L.) Rafin. Fl. Tellur. iii. 12 (1836); Small, Fl. S. E. U. S. 375.

Polygonum virginianum L. Sp. Pl. 360 (1753).
Persicaria virginiana (L.) Gaertn. Fruct. ii. 180 t. 119 f. 3 (1791).
Polygonum muticum Moench, Meth. Suppl. 266 (1802).

A pubescent or nearly glabrous perennial with erect terete stems reaching a height of 1–2 m.: leaf blades ovate-acuminate 5–15 cm. long and 2–8 cm. broad, glaucescent beneath: inflorescence 15–35 cm. long, of 1–3-flowered fascicles, scattered 1–1.3 per cm. of the rachis:

ocreolae glabrous, but the top margins ciliolate: rachis often glabrous above: perianth greenish to rose colored at maturity, persistent and enlarged in fruit to a length of 3.5–5. mm., enclosing the brown or black lenticular achene.

Eastern North America and eastern Asia.

Beal (Seed Dispersal, p. 73) has called attention to the interesting methods by which the fruits of this species are dispersed. At maturity a tension develops in the joint of the pedicel "so that, if touched, the fruit goes with a snap and a bound for several feet." Also, the persistent styles with recurved tips serve as a means of attachment to the fur of animals by which the fruits may be carried about.

1a. **Tovara virginiana** (L.) Rafin. var. **filiformis** (Thunb.) comb. nov. [PLATE I. A.]

Polygonum filiforme Thunb. Fl. Jap. 163 (1784).

Persicaria filiformis (Thunb.) Nakai, Fl. Quelpaert Is. 41 (1914).

Polygonum neo-filiforme Nakai in B. M. T. xxxvi. 117 (1922).

This variety differs from the American plant in having leaves obovate-acuminate, cuneate at the base and the whole plant (especially the ocreolae and rachis) usually scabrid: fascicles averaging 2 or more per cm. of the rachis: perianth usually dark red at maturity.

Eastern Asia.

CHINA. YUNNAN: *Forrest 11770* (UC-2 sheets). SZECHUAN: *W. P. Fang 2471* (NY). HUPEH: *Y. Chen 3123* (UC); *S. S. Chien 5233* (UC); *Henry 4784* (GH); *E. H. Wilson 2076* (NY). KIANGSU: *C. Y. Chiao 63* (UC); *K. Ling 2582* (GH, UC); *Herb. U. Nanking 229* (GH, UC, MBG, BS); *A. N. Steward 1198* (UC). CHEKIANG: *Cheo & Wilson 221* (GH, UC-2 sheets); *R. C. Ching 2322* (GH, UC, US), *3690* (UC), *4705* (UC, US), *5041* (UC); *H. H. Hu 468* (BS); *Y. L. Keng 1002* (UC); *K. Ling 2483* (GH, UC); *K. K. Tsoong 3045-A & 3045-B* (BS). FUKIEN: *H. H. Chung 2942* (GH, UC). KWANGTUNG: *Merrill 10844* (BS); *Tsang & Wong 2907* (UC); *Y. Tsiang 1300* (UC).

JAPAN. HOKKAIDO: *Albrecht* (GH); *Arimoto* (GH-2 sheets, MBG); *Brooks 623* (UC); *Maximowicz* (GH). HONDO: *Iishiba* (UC); *Herb. New York Bot. Gard.; Savatier 1031* (US). KIUSIU: *Tanaka 100276* (UC). WITHOUT LOCALITY: *Gandoger* (MBG); *Herb. A. Gray* (T); *Herb. Lugd.-Bat.* (GH, MBG, NY), *9* (C), *172* and *197* (M).

There are exceptions on both sides to all of the characters by which the Asiatic variety is separated from the typical American form, but there are such clearly divergent tendencies that the plants can hardly be considered identical. *P. neo-filiforme* of which no specimens have been seen is distinguished by "venis non-impressis ita folia viva plana."

1b. **Tovara virginiana** (L.) Rafin. var. **kachina** Nieuwland in Am. Mid. Nat. ii. 182 (1912).

This variety diverges from var. *filiformis* in having particularly

coarse pubescence, especially on the leaves and ocreae: leaf blades rather narrowly obovate-cuneate and smaller than in the preceding (3–8 cm. long).

Continental southeastern Asia.

CHINA. KWEICHOW: *Schoch 409* (GH, US).
FARTHER INDIA. BURMA: *Clarke 40937-F* (C).

1c. **Tovara virginiana** (L.) Rafin. var. **apoensis** (Elmer) comb. nov. [PLATE I. C.]

Polygonum apoense Elmer, Leafl. Philipp. Bot. viii. 2796 (1915); Mer. 121.

This variety differs from the type in being a plant of less average height (4–6 dm.) and with smaller leaf-blades (averaging 8 cm. long by 3.5 cm. broad) which are definitely cuneate from above the middle. The inflorescence is more sparsely branched in this variety.

Apparently indigenous to the Philippine Islands.

PHILIPPINES. MINDANAO: *Alvarez* [*PFB 25230*] (US, BS); *M. S. Clemens 2114, 15649* (UC); *Elmer 10754* (GH, MBG, US, BS).

KOENIGIA L.

A slender glabrous annual. Plants 2–15 cm. high. Leaves petiolate; blades oblong to obovate, 3–8 mm. long, usually rounded at the tip. Flowers minute, in axillary fascicles subtended by ovate bracts which are neither tubular nor sheathing. Perianth 3-cleft. Stamens 3, borne on the perianth and alternate with its lobes. Stigmas 2 or 3. Achene usually lenticular, somewhat exceeding the perianth at maturity. [Linn. Mant. i. 3 (1767).]

One species in arctic regions, and known also from the Altai and Himalayan mountains of Asia.

There has been considerable difference of opinion and some confusion concerning *Koenigia*. It is presented as generically distinct from *Polygonum* because of the 3-cleft perianth, with 3 alternately arranged stamens, and is represented only by *K. islandica*. This position was taken by Ledebour (p. 534), but later Meisner (in DC. 82) included other species and described the perianth as "3–4-partitus." Finally Hooker f. (p. 24) reduced *Koenigia* to a section of *Polygonum* with "perianth 3–5-cleft." Since the 3-cleft perianth appears constant in *K. islandica* it seems best to uphold the generic status of *Koenigia*.

1. **Koenigia islandica** L. Mant. i. 35 (1767); Led. 535; M. in DC. 83; S. 171. [PLATE I. E; PLATE II. 1 and 2.]

Characters of the genus.

Distributed in arctic and subarctic regions, and in the higher mountains of eastern Asia.

BRITISH INDIA. Sikkim: *Hooker* (GH).
CHINA. Tibet: *T. Thomson* (GH). Kansu: *R. C. Ching 593* (GH-2 sheets).

POLYGONUM [Tourn.] L.

Herbs and shrubs. Stems often conspicuously swollen at the nodes. Leaf bases attached to stipular sheaths called ocreae. Inflorescence of sessile fascicles springing from sheaths (ocreolae) and either axillary or more often spicately dispersed in elongated panicles (for brevity generally called, as in the present paper, spikes). Spikes solitary and terminal or numerous and themselves panicled. Flowers one to several in a fascicle, on jointed pedicels. Perianth 4–6-parted, often petal-like and frequently persistent in fruit. Stamens 3–9. Styles 2 or 3, deciduous. Achenes lenticular or triangular. [Linn. Gen. Pl. ed. 5. 170 (1754).]

Key to Sections.

A. Flowers in axillary fascicles or spikes; styles 3-parted; achenes triangular: leaves small, cauline only, and more or less fleshy, mostly oblong to lanceolate and glabrous; ocreae membranous or hyaline, 2-cleft or lacerate at maturity: stems striate, often prostrate ..... § 1. Aviculania.

A. Fascicles usually not axillary (except in certain species of § *Cephalophilon* in which the leaf-blades are ovate or broadly lanceolate and from 3 to 30 mm. long, and, except in *P. delicatulum*, more or less pubescent): style 2- or 3-parted; achenes lenticular or triangular: leaves large (over 2 cm. long), or if small then pubescent; ocreae various, rarely hyaline: stems mostly erect or climbing ..... *B*

B. Inflorescence spiciform ..... *C*

C. Spikes solitary and terminal: ocreae eciliate, not cylindric, split obliquely (at least at the summit): stems simple and erect: leaves both radical and cauline: plants perennial, glabrous ..... § 2. Bistorta.

C. Spikes several, racemosely or paniculately arranged: ocreae various: stems branched: leaves cauline: plants annual or perennial, glabrous or pubescent ..... *D*

D. Spikes cylindric to subfiliform, not capitate; ocreae tubular ..... § 3. Persicaria.

D. Spikes ovoid or subglobose, capitate: ocreae not tubular ..... § 4. Cephalophilon.

B. Inflorescence more or less openly paniculate, or rarely of subcapitate panicles ..... *E*

E. Stems and petioles armed with recurved spines or prickles; usually with vine-like habit: leaves broad, often hastate; ocreae tubular ..... § 5. Echinocaulon.

E. Plants not armed: leaves not hastate ..... *F*

F. Three of the perianth segments enlarged and bearing wing-like expansions in fruit (except in *P. cynanchoides* and *P. Convolvulus*): faces of achenes black, more or less roughened ..... § 6. Tiniaria.

F. Perianth segments not enlarged in fruit (except in *P. tripterocarpum, P. Weyrichii* and *P. campanulatum*): faces of the achenes brown, smooth or roughened ..... *G*

G. Leaves ovate to linear-lanceolate: cotyledons accumbent: surfaces of the achenes smooth and shining.....§ 7. ACONOGONON.

G. Leaves triangular, sometimes cordate or sagittate at the base; cotyledons rolled around the ascending radicle: surfaces of the achenes dull brown, sometimes streaked.....§ 8. FAGOPYRUM.

Section 1. AVICULARIA [Tourn.] Meisn. Prodr. Polygon. 43, 85 (1826).

KEY TO SPECIES.

a. Ocreae membranous or somewhat hyaline, conspicuously nerved throughout more than half their length....*b*

b. Plants shrubby: leaves elliptic to ovate: ocreae each with two excurrent nerves....*c*

c. Nerves of the ocreae thickened and aristate, exserted. 1. *P. biaristatum.*

c. Nerves of the ocreae not thickened and aristate, rarely exserted....*d*

d. Leaf blades ovate: achenes smooth and shining.....2. *P. recumbens.*

d. Leaf blades linear: achenes dull and striate.....3. *P. Roylii.*

b. Plants herbaceous: leaves oblong to linear-lanceolate: ocreae early becoming lacerate; nerves more or less excurrent....*e*

e. Achenes smooth and shining....*f*

f. Achenes exceeding the perianth: axils bearing a fascicle of 4–10 flowers: stems smooth: leaves linear to oblong 4. *P. humifusum.*

f. Achenes included in the perianth: leaves linear to lanceolate, often deciduous.....5. *P. argyrocoleon.*

e. Achenes opaque, roughened....*g*

g. Achenes exserted from the perianth at maturity: ocreae many-nerved.....6. *P. polyneuron.*

g. Achenes about equal to the perianth: ocreae few-nerved....*h*

h. Achenes punctulate but not striate: flowering branches leafless or with leaves much reduced at the tips.....7. *P. Bellardi.*

h. Achenes striate-punctulate: flowering branches leafy to the tips.....8. *P. aviculare.*

a. Ocreae hyaline, not conspicuously nerved, or nerved only at the base....*i*

i. Plants shrubby....*j*

j. Leaves linear-lanceolate....*k*

k. Leaves less than 1 cm. long: ocreae equaling or exceeding the leaves on young shoots.....9. *P. paronychioides.*

k. Leaves 1.–2.5 cm. long: ocreae shorter than the leaves 10. *P. afghanicum.*

j. Leaves ovate to oblong-spathulate, 1–3 cm. long: ocreae much shorter than the leaves.....11. *P. cognatum.*

i. Plants herbaceous....*l*

l. Achenes lustrous (except in *P. Miquelianum* where they are obsolete-striate near the angles)....*m*

m. Internodes short, covered with overlapping hyaline ocreae, especially the upper ones....*n*

n. Stems 1–3 cm. tall, capillary.....12. *P. molliaeforme.*

n. Stems 10 cm. or more tall, with comparatively stout branches, 2 mm. or more in thickness.....13. *P. tubulosum.*

m. Internodes long: ocreae not overlapping....*o*
o. Flowers and fruits projecting from the fimbriate ocreae or exserted on short pedicels, usually not over 2 mm. long: achenes smooth and shining. 14. *P. plebeium.*
o. Flowers and fruits exserted on slender pedicels 3–4 mm. long: achenes obsolete-striate near the angles 15. *P. Miquelianum.*

l. Achenes black: faces punctulate....*p*
p. Perianth scarcely over 1 mm. long, exceeded by the mature achene: leaves membranous, oval....16. *P. cashmirense.*
p. Perianth about 2 mm. long, equal to the mature achene: leaves coriaceous, linear to ovate....*q*
q. Leaves linear-subulate; veins not prominent..17. *P. polycnemoides.*
q. Leaves ovate to lanceolate, coarsely venose beneath 18. *P. venosum*

1. **Polygonum biaristatum** Aitch. & Hemsl. in Journ. Linn. Soc. xviii. 90 (1880); G. 378.

Low dense shrub: leaf-blades up to 1 cm. long: ocreae bearing a pair of aristate bristles: internodes short: ocreae overlapping on young shoots.

BRITISH INDIA. Himalayas: *Dudgeon & Kenoyer* (MBG).
AFGHANISTAN. *Aitchison 816* (GH).

2. **Polygonum recumbens** Royle ex Bab. in Trans. Linn. Soc. xviii. 116 (1838); H. 25; G. 378.

Recumbent shrub with scabrid and somewhat ascending branches: leaves rather crowded, short-petiolate; blades 1.–2.5 cm. long, ovate or broadly elliptic, with scabridulous margins; midribs scabridulous beneath: ocreae membranous, bearing strong excurrent nerves: internodes elongated at maturity to exceed the ocreae: flowers axillary and shortly exserted; perianth about 2 mm. long.

BRITISH INDIA. Kumaon: *Strachey & Winterbottom 41* (GH, C); *Wallich* (M). Garhwal: *King* (US). Punjab: *Drummond 26769* (UC). Kashmir: *Clarke 22209-A* (US). Northwest Himalayas: *Dudgeon & Kenoyer* (MBG-2 sheets); *T. Thomson* (GH). Without Locality: *Falconer 833* (GH, T); *Jacquemont 2296* (BS).

3. **Polygonum Roylii** Bab. in Trans. Linn. Soc. xviii. 115 (1838); M. in DC. 98.

Prostrate perennial herb: stems 3–4-angled, the angles scabridulous: ocreae rather conspicuous, each with two prominent shortly excurrent nerves: leaves linear-lanceolate, surfaces glandular-dotted: flowers axillary, sessile; perianth about 3 mm. long: achenes triangular, about equal to the perianth in length; faces granulate-striate.

BRITISH INDIA. Garhwal: *Strachey & Winterbottom 49* (GH). Punjab: *Drummond 22203* (UC). Kashmir: *R. R. Stewart 4759* (NY). Himalayas: *Royle* (GH).
CHINA. Tibet: *T. Thomson* (GH).

4. **Polygonum humifusum** Pall. ex Ledeb. Fl. Ross. iii. 531 (1846–51); M. in DC. 95.

A smooth branching prostrate herb: leaves linear to oblong, obtuse: infiorescence at the tips of the branches; fascicles 4–10-flowered: achenes smooth, exceeding the perianth.

Altai region of Siberia.

Not seen.

5. **Polygonum argyrocoleon** Steud. ex Kunze in Linnaea xx. 17 (1847); Boiss. Fl. Orient. iv. 1035.

P. deciduum Boiss. et Noë in Bot. Zeit. xi. 734 (1853), nom. nud.—acc. to Boiss. l. c.

P. Noëanum Boiss. et Noë in l. c., nom. nud.—acc. to Boiss. l. c.

Erect annual with slender branches: ocreae membranous, lacerate: leaves linear-lanceolate, often deciduous: flowering spikes slender, naked: flowers pedicelled, shortly exserted from the ocreolae; perianth about 2 mm. long: achenes equal to the perianth, brown, smooth and shining.

AFGHANISTAN. *Griffith 4096* (GH).
CHINA. SUNGARIA: *Schrenk* (GH, US).

In habit like some forms of *P. Bellardi*, but distinguished by the shining achenes. Two specimens of the type number, *Kotschy 440*, were seen (MBG).

6. **Polygonum polyneuron** Franch. et Savat. Enum. Pl. Jap. ii. 471 (1879); Mat. 61.

"*P. maritimum* L." Franch. & Savat. op. cit. i. 393 (1875),—not of Linn., op. cit. ii. 471.

Annual or perennial herb: stems slender and striate; branches erect and fastigiate: ocreae lax, many-nerved: leaves membranous, obtuse at the apex: flowers few, included in the ocreae: achenes dark, about 3 mm. long, opaque, punctulate, exserted from the perianth at maturity.

Japan.

Not seen.

7. **Polygonum Bellardi** All. Fl. Pedem. ii. 207, t. 90, f. 2 (1785); M. in DC. 98; G. 380.

P. patulum Bieb. Fl. Taur.-Cauc. i. 304 (1808),—acc. to Led. 530.

P. strictum Ledeb. Fl. Alt. ii. 86 (1830),—acc. to Led. l. c. =var. *gracilius*.

P. junceum Ledeb. 529 (1846–51).

"*P. equisetiforme* Sibth & Smith." Meisn. in Miq. 56 (1865–66).

"*P. oxyspermum* Mey. et Bunge" Franchet & Savat. ii. 473 (1879).

Erect herb with slender branches: ocreae thin, lacerate: leaves lanceolate to linear, few and much reduced near the tips of the branches: flowers not abundant, in fascicles of 5 or less, near the almost leafless branch tips: achenes included, triangular; faces dull and minutely punctate.

AFGHANISTAN. *Aitchison 656* and *696* (GH).
CENTRAL ASIA. TURGAI: *Dessiatoff 672* (MBG). ALA TAU: *Rosheritz 193* (BS). SEMIPALATINSK: *Karelin & Kiriloff 1028* (T).
SIBERIA. ALTAI: *Ledebour* (MBG-2 spec.).
CHINA. SUNGARIA: *Karelin & Kiriloff 1030* (C, T); *Schrenk* (GH-4 spec. on 2 sheets).
KOREA. *Faurie 562* (BS).
JAPAN. WITHOUT LOCALITY: *Herb. Lugd.-Bat.* (GH) and *14* (M).

In *P. junceum* the only distinctive character seems to be "caryopsi perigonium subexcedente." A specimen labelled *P. equisetiforme* from Japan in the Meisner Herbarium appears to be *P. Bellardi*, though the material is imperfect.

8. **Polygonum aviculare** L. Sp. Pl. 362 (1753); H. 26; G. 379; Hultén in Kungl. Sven. Acad. Handl. v. No. 2. 50; S. 172.

P. Meyenii C. Koch in Linnaea xxii. 205 (1849)?

P. gymnopus Franch. & Savat. Enum. Pl. Jap. ii. 472 (1879).

P. Debeauxii Legrand in Bul. Soc. Bot. Fr. xxx. 71 (1883).

Slender glaucous prostrate or ascending annual: branches grooved, leafy to the tips: leaves elliptic to lanceolate: flowers in axillary fascicles, nearly sessile: achene triangular; the faces roughened, finely striate.

Widely distributed in temperate and subtropical regions.

BRITISH INDIA. GARHWAL: *Strachey & Winterbottom 21* (GH). KASHMIR: *Schlagintweit 4258* and *4638* (M); *R. R. Stewart* (NY).
AFGHANISTAN. *Aitchison 779* (GH).
SIBERIA. YENISEISK: *Tugarinowa* (UC). TRANSBAICALIA: *Karo 49* and *486* (MBG). SAKHALIN: *Augustinowicz* (UC, BS-2 sheets). LOCALITY?: *Bohnhof 218* (NY-2 sheets).
CHINA. TIBET: *T. Thomson* (GH—2 sheets); *Walton 94* (BS). SUNGARIA *Schrenk* (GH). MONGOLIA: *Chaney 312* (GH, UC), *337* (UC), *381* (GH, UC, NY), *459* (UC). MANCHURIA: *Kozlov* (UC); *Voilykoff* (UC). KANSU: *R. C. Ching 1093* (GH, UC). SHANSI: *N. Han 29* (UC); *C. O. Lee* [*UN 6069*] (UC). CHIHLI: *Clemens 1770* and *1771* (BS); *J. C. Liu 1770, 1993* (UC); *Meyer 1127* (GH). SHANTUNG: *Clemens 1369* (BS); *Zimmermann 196* (GH, US). HONAN: *Ritchey* [*UN 7462*] (UC). HUPEH: *Henry 4860* (GH); *K. K. Tsoong 3015-B* (BS). ANHWEI: *Griffing* [*UN 2953*] (UC); *Y. L. Keng 1474* (UC). KIANGSU: *Allison 112* (GH, US); *C. Y. Chiao 733* (UC); *R. C. Ching 3902* (UC); *Herb. Univ. Nanking 222* (UC, MBG, US, BS); *A. N. Steward 208* (BS). CHEKIANG: *Barchet 552* (US). FUKIEN: *Fukien Chr. Univ. 12511, 13034* (UC). KWANGTUNG: *K. K. Tsoong 3015-A* (BS).
JAPAN. HOKKAIDO: *Arimoto* (GH, MBG); *Brooks* (UC). HONDO: *Tanaka 100274* (UC, US); *Watanabe* (OA, US).

Meisner (in DC. 93, 141) was uncertain as to whether *P. Meyenii* was more like *P. Roxburghii* or *P. aviculare*. *P. Debeauxii* is said to be separated from *P. aviculare* by its long flexuous spikes and by its achenes (?). *P. gymnopus* is noted for its slender stem and more obtuse leaves.

8a. **Polygonum aviculare** L. var. **vegetum** Lædeb. Fl. Ross. iii. 532 (1846–51); M. in DC. 97; Mat. 55.

P. Fauriei Lévl. & Vant. ex Lévl. in Bul. Soc. Bot. Fr. li. 423 (1904) —acc. to Samuelsson.[1]

Persicaria Fauriei (Lévl. & Vant.) Nakai in Mori, Enum. Pl. Cor. 131 (1922).

A coarse erect herb: leaves petiolate; blades oblong to lanceolate, 2–4 cm. long, the margins usually crispate: plants generally without the glaucous bloom which is common in typical *P. aviculare*.

Temperate and subtropical regions of the northern hemisphere.

AFGHANISTAN. *Aitchison 632: 655* (GH).
SIBERIA. Locality?: *Bohnhof 166* (NY).
CHINA. Sungaria: *Herb. Acad. Petrop* (GH). Yunnan: *Ducloux 538* (UC); *E. E. Maire 371* (UC), *674* (UC, BS), *3304* (GH, UC, BS). Shansi: *K. Ling 1870* (UC). Chihli: *Clemens 1772, 8065, 8065a, 8065b, 8065c* (BS); *J. C. Liu 471* (UC). Honan: *A. N. Steward 1525* (GH, UC, US). Hupeh: *Henry 4803* (GH), *5194* (US). Kiangsu: *Faber* (MBG, NY); *H. T. Feng 161* (GH). Chekiang: *R. C. Ching 1361* (UC, US); *Henry* (NY). Fukien: *Metcalf & Chang 761* (UC, US).
KOREA. *Faurie 560* and *561* (BS).
JAPAN. Hokkaido: *Brooks 710* (UC); *Herb. Sapporo Agr. Col.* (GH). Hondo: *Matsumura* (US); *Tanaka 200010* (UC); *United States Nat. Herb. 44487* and *1396929; Watanabe* (US). Kiusiu: *Oldham 687* (GH). Locality? "Simoda": *United States Nat. Herb. 26163; Williams* (GH). Without Locality: *Faurie 4851* and *5131* (BS).

9. **Polygonum paronychioides** C. A. Mey. in Bul. Soc. Imp. d. Nat. Mosc. xi. 356 (1838); H. 26; G. 379.

P. Paronychia C. A. Mey. Verz. Pfl. Cauc. 158 (1831),—not of Cham. & Schlect.

P. mucronatum Royle ex Bab. in Trans. Linn. Soc. xviii. 115 (1838).

P. Meyeri Steud. Nomen. ed. 2. ii. 376 (1841), a typonym based on the preceding.

P. pauciflorum Endl. Gen. Suppl. IV. ii. 49 (1847), a typonym based on *P. Paronychia* C. A. Mey., not of Cham. & Schlect.

P. Mezianum H. Gross in Engler Bot. Jahrb. xlix. 342 (1913).

P. himalayense H. Gross op. cit. 343 (1913).

P. Englerianum H. Gross op. cit. 344 (1913).

A low tufted shrub: young branches concealed by overlapping ocreae: leaves linear, less than 1 cm. long: ocreae hyaline, lacerate,

[1] Samuelsson according to letter from Dr. W. W. Smith.

2-nerved, conspicuous on young shoots, equaling or exceeding the leaves: two outer perianth lobes awned from the back in fruit: achene triangular, smooth, black.

Distributed in the western Himalayas, Afghanistan, Persia and the Caucasus.

BRITISH INDIA. PUNJAB: *R. R. Stewart 1006* (NY). KASHMIR: *Gammie* (UC); *Schlagintweit 11761* (GH); *R. R. Stewart* (NY—2 spec.).
CHINA. TIBET: *Schlagintweit 806* (US); *T. Thomson 2* (GH).

P. mucronatum is characterized by leaves long-mucronate, margins recurved, according to Babington. *P. Mezianum* has leaves not at all acuminate; ocreae lax and equal to the internodes of the stem or shorter; stem nearly smooth. *P. himalayense* differs from *P. Mezianum* by: tube of perianth short, punctate-papillose; ocreae not at all white, but somewhat dark; internodes of the stem less conspicuous than the ocreae; filaments long. *P. Englerianum* differs from *P. paronychioides* by: leaves as long as the ocreae or rarely longer; flowers easily separated, according to Gross.

10. **Polygonum afghanicum** Meisn. in DC. Prodr. xiv. 90 (1856).

A low many-stemmed shrub, the erect branches often herbaceous and somewhat angled, puberulent: ocreae hyaline, lacerate on the margins, shorter than the leaves: leaves linear-lanceolate, 1.–2.5 cm. long, with margins often revolute and with mucronate tips: flowers, solitary, sub-sessile.

South-central Asia.

AFGHANISTAN. *Griffith 1724* (M).
CENTRAL ASIA. BOKHARA: ? *2114* (MBG).

11. **Polygonum cognatum** Meisn. Prodr. Polygon. 91 (1826); H. 25; G. 378.

P. affine Steph. ex Spreng. Syst. ii. 256 (1825),—not of D. Don—acc. to H. l. c.

P. alpestre C. A. Mey. Verz. Pfl. Cauc. 157 (1831)—acc. to H. l. c.

P. confertum Royle ex Bab. in Trans. Linn. Soc. xviii. 116 (1838).

P. rupestre Kar. & Kir. in Bul. Soc. Imp. d. Nat. Mosc. 1841, p. 740—acc. to H. 26.

P. ammanioides Jaub. & Spach, Icon. Pl. Orient. t. 119 (1847)—acc. to H. l. c.

P. myriophyllum H. Gross in Engl. Bot. Jahrb. xlix. 344 (1913).

Low prostrate shrub with stout branches, brown-scaly at the base: ocreae hyaline, ovate: leaves petiolate; blades oblong to ovate, mucronate, tapering to the petiole, almost fleshy in texture, 1–2 cm. long:

perianth thick, urn-shaped, about 3 mm. long: achene triangular, smooth.

Himalaya and Altai regions, and Tibet.

BRITISH INDIA. KAMAON: *Schlagintweit 9687* (GH, US). GARHWAL: *Strachey & Winterbottom 46* (GH). KASHMIR: *R. R. Stewart* (NY) and *6713, 7488* (NY). NORTHWESTERN HIMALAYAS: *T. Thomson* (GH).
CHINA. SUNGARIA: *Schrenk 97* (GH, US), *295* (GH).

P. confertum is distinguished from *P. recumbens* by the structure of the ocreae and by the perianth spreading in fruit and not keeled, according to Babington. *P. myriophyllum* is distinguished from *P. biaristatum* by sub-nerveless fimbriate ocreae and leaves which are not at all mucronate, according to Gross.

12. **Polygonum molliaeforme** Boiss. Diagn. I. vii. 84 (1846); H. 27; G. 382.

A slender herb: stems up to 5 cm. high, branching dichotomously: ocreae hyaline, not equaling the leaves: leaves awl-shaped, 5–10 mm. long: flowers axillary, concealed by the ocreae; perianth cleft to below the middle: achenes triangular, smooth and shining.

BRITISH INDIA. LAHUL: *R. R. Stewart* (NY).
CHINA. TIBET: *Schlagintweit 2384* (GH); *T. Thomson* (GH).

Two sheets of the type number, *Kotschy 778*, from Persia have been seen from the MBG herbarium.

13. **Polygonum tubulosum** Boiss. Diagn. I. vii. 83 (1846); Fl. Orient. iv. 1032; H. 27; G. 381.

P. rottboellioides Jaub. & Spach. Ill. Pl. Or. t. 122 (1847)—acc. to H. l. c.

P. acerosum Ledeb. ex Meisn. in DC. 92 (1856).

P. Lemannianum Meisn. in DC. 91 (1856).

Slender more or less branching annual with short internodes and with hyaline often overlapping ocreae: leaves linear, with recurved margins: flowers scarcely protruding from the ocreae, 1–2 mm. long: achene triangular, black; faces smooth and shining.

Central Asia.

BRITISH INDIA. NORTHWESTERN HIMALAYAS: *R. R. Stewart* (NY).
LOCALITY?: *Griffith 1726* (M).
AFGHANISTAN. *Aitchison 215* (GH).
CHINA. SUNGARIA: *Schrenk* (GH).

The writer has also seen a specimen of the type number, *Hohenacker 500* (MBG), from Persia. The descriptions of *P. acerosum* and *P. Lemannianum* do not show clearly how these species may be separated from *P. tubulosum*. The type of *P. Lemannianum*, *Griffith 1726* (M), is very like that of *P. tubulosum*.

14. **Polygonum plebeium** R. Brown, Prodr. Fl. Nov. Holl. 420 (1810); H. 27; G. 383; Mer. 124; S. 171.

P. aviculare Lour. Fl. Cochinch. i. 241 (1790)—not of Linn.

P. elegans Dryand. in Ait. Hort. Kew. ed. 2. ii. 419 (1811)—acc. to Ind. Kew.

P. indicum Heyne ex Roth, Nov. Pl. Sp. 208 (1821)—acc. to H. 28.

P. linifolium Roth, op. cit. 207 (1821)—acc. to H. 28.

P. Dryandri Spreng. Syst. ii. 255 (1825). *P. elegans* Dryand. is given as a syn.

P. prostratum Roxb. ex D. Don, Prodr. Fl. Nep. 72 (1825), in syn =*P. aviculare*. This is *P. plebeium* var. *elegans* acc. to H. 29.

P. herniarioides Delile ex Meisn. 89 (1826) –acc. to Dan. 140.

P. Cliffortioides Meisn. in Wall. 62 (1832)—acc. to Dan. l. c.

P. elegans Roxb. Fl. Ind. ii. 291 (1832)—acc. to H. 29.

P. anomalum De Br. in Miq. Pl. Jungh. 311 (1854)—acc. to Dan. l. c.

P. styligerum De Br. in Miq. l. c. (1854)—acc. to Dan. l. c.

P. ciliosum Meisn. in DC. 85 (1856)—acc. to Dan. l. c.

P. effusum Meisn. in DC. 93 (1856)—acc. to Dan. l. c.

P. illicebroides Meisn. in DC. 94 (1856)—acc. to Dan. l. c.

P. Perrottetii Meisn. in DC. 94 (1856)—acc. to Dan. l. c.

P. Roxburghii Meisn. in DC. 93 (1856)—acc. to Dan. l. c.

P. micranthemum Franch. ex Hook. f. 29 (1886)—in syn. = var. *micranthema*.

A much-branched prostrate herb: branches chaneled, the internodes often shorter than the leaves: ocreae hyaline, lacerate, not conspicuously nerved: leaves oval to narrowly oblong, often spathulate, up to 1.5 cm. long: flowers 1–3 in a fascicle, axillary: achene included in the perianth, black, smooth and shining. An exceedingy variable species as to habit and leaf form.

Widely distributed, especially in the tropical regions of the Old World.

BRITISH INDIA. Madras: *Campbell 49* (BS—2 sheets); Narayama (UC); *Wight* (M). Mysore: *G. Thomson* (GH, M). Bombay: *Hohenacker* (M). Sind: *Schlagintweit 10987* (GH). Central Provinces: *Clarke 31974* (C); *Kuntze 7295* (NY). Bengal: *Clarke 34587-F, 34872-E, 35559-B* (C); *Columbia Herb.; Dudgeon* (MBG); *Griffith 4097-1* (GH); *T. Thomson* (GH); *Wallich 1691-1* (C, M), *1691-K* (C). Assam: *Chatterjee* (US); *DeSilva* (C); *Wallich* (M). Sikkim: *Kuntze 6996* (NY). Eastern Himalayas: *Edinburgh Bot. Gard.* (GH, US, NY); *Griffith 4099* (GH). Nepal: *Wallich* (M). Oude: *Wallich* and *1691-3* (M). Kumaon: *Blinkworth* (M); *U. Singh 211* (UC); *Strachey & Winterbottom 22* (GH), *23* (GH, M). Simla: *Drummond 523* (UC). Punjab: *Drummond* (UC); *Schlagintweit 2578* (US, M), *2743* and *10183* (US), *10486* (GH), *10568* (M), *10935* (GH), *11178* and *11630* (M); *R. R. Stewart* (NY) and *1389* (MBG, NY); *T. Thomson* (GH, M). Hazara: *Duthie 19001!* (UC). Himalayas: *Dudgeon & Kenoyer 79* (MBG). Locality?: *Clarke*

11595-A and *21432-A* (US); *Falconer 834* (GH, T); *Herb. Hamilton* (M); *Heyne etc.* (US); *Wight 12* (NY, C), *2452* (GH, T).

CHINA. Yunnan: *E. E. Maire 372* (UC), *675* (UC, BS), *3305* (UC, BS—2 sheets). Chihli: *Clemens 8066, 8066a* (BS—2 sheets each); *Cowdry 346* (US). Hupeh: *Henry 3601* (US), *7746* (GH). Fukien: *H. H. Chung 1199* (UC). Kwangtung: *Groff* [*CCC 2219*] (BS); *Kuntze 3460* (NY); *Levine* [*CCC 198*] (MBG, US, BS); *McClure 1993* (UC); *Merrill 9835* (BS). Hongkong: *Wright 419* (GH, US, T).

FORMOSA. *Faurie 753, 756* (BS); *Henry* (MBG) and *1756* (MBG, NY, US); *Kawakami & Nakahara 707* (BS); *Oldham 428* (GH, T), *433* (GH).

FARTHER INDIA. Indo-China: *Petelot 92* (BS), *3282* (UC-Coll. Colani). Siam: *Groff* (BS). Burma: *Gallatly 952* (US); *Griffith 4100* (GH); *Helfer 4102* (GH); *Huk 42* (GH); *Kurz 519* (BS).

PHILIPPINES. Luzon: *Clemens 17037* (UC); *Elmer 5968* (US, NY, BS); *Loher 4597* (US—2 sheets); *Merrill 825* (US, BS); *Ramos* [*PBS 7811*] (US, BS), [*PBS 8117*] (NY, BS). Without Locality: *Cuming 1289* (M, MBG, BS).

EAST INDIAN ISLANDS. *Hooker* (T). Java: *Teysmann* (GH); *de Vriese 118* (M); *Zollinger 2555* (GH).

The achene of *P. effusum* is said to be obsoletely striate at the tip.

15. **Polygonum Miquelianum** Meisn. in DC. Prodr. xiv. 92 (1856).

P. plebeium R. Br. var. *Miqueliana* H. 29 (1886).

P. plebeium R. Br. var. *polyneura* H. l. c. (1886).

A prostrate annual with rather stout straggling branches: leaves oblong to obovate, up to 1 cm. long: flowers 2–4 mm. long, on slender pedicels equaling or exceeding the length of the flowers: achenes 2.–2.5 mm. long, triangular; surfaces smooth and shining.

BRITISH INDIA. Bombay: *Univ. California 322733; Hohenacker 19a* (M); *Metz* (US). Without Locality: *Columbia Univ.*

All the specimens seen, for which data is given, are from the type locality, Mangalore, Bombey Presidency, British India. From the description as well as from the specimens cited it would appear that both of Hooker's varieties listed above should be included here.

16. **Polygonum cashmirense** H. Gross in Engl. Bot. Jahrb. xlix. 342 (1913).

A prostrate slender branching annual: leaves short-petiolate, often deciduous; blades oval, 5–8 mm. long: ocreae brownish at the base, inconspicuous: flowers axillary; perianth about 2 mm. long: achene triangular, brownish, exserted for one-fourth to one-half its length; faces punctulate.

Western Himalayas.

BRITISH INDIA. Kashmir: *Schlagintweit 4290* (GH).

17. **Polygonum polycnemoides** Jaub. et Spach Ill. Pl. Or. t. 120 (1847); M. in DC. 92; G. 381.

P. Oliveri Jaub. et Spach, l. c. t. 121 (1847)—acc. to Boiss. Fl. Orient. iv. 1033.

A prostrate branching herb with appressed linear-subulate leaves: ocreae hyaline, white, conspicuous, sometimes lacerate: flowers axillary, near tips of the branches, sessile, about 2 mm. long: achenes triangular, black, included in the perianth; faces minutely punctate.

South-central Asia.

AFGHANISTAN. *Griffith 862* or *1727?* and *1729* (M), *4103* (GH, T).
CHINA. TIBET: *Schlagintweit 1539* (GH); *T. Thomson* (GH). WITHOUT LOCALITY: *Falconer 834* in part (GH); *Jacquemont 1940* (BS).

P. Oliveri is characterized by a shortly lobed perianth and *P. polycnemoides* by a moderately lobed perianth.

18. **Polygonum** (§ **Avicularia**) **venosum** sp. nov. [PLATE I. D and F; PLATE II. 3 and 4.]

Planta glabra; caulibus striatis curvato-adscendentibus; ocreis hyalinis laciniatis quam foliis et internodiis brevioribus; foliis sessilibus coriaceis ovato-lanceolatis integerrimis, saltim post exsiccationem pallide rufescentibus, 3–8 mm. longis, margine paullo recurvatis et subincrassatis, subtus prominenter venosis; floribus axillaribus, breviter pedicellatis; perianthio 2 mm. longo ut videtur roseo; achenio triangulare longitudine perianthium subaequante, faciebus tenuiter granulato-striatis.

Plant glabrous: stems striate and curved-ascending: ocreae hyaline, lacinate, shorter than the leaves and internodes: leaves sessile, coriaceous, the upper ovate and the lower lanceolate, entire, brownish red after drying, 3–8 mm. long; margin somewhat recurved and hardened; the veins prominent beneath, pinnately arranged and diverging from the midvein with so narrow an angle as to appear subparallel: flowers axillary, on short pedicels, congested on the tips of lateral branches into leafy-bracted spikelike clusters: perianth apparently rose colored, about 2 mm. long, 5-cleft to below the middle; the lobes broadly rounded at the top and with a single prominent midvein which throughout its length bears short rather narrowly divergent branches: achene triangular, about equal in length to the perianth; surfaces finely granulate-striate.

CHINA. SUNGARIA: *Gandoger* (MBG Herb. No. *124702*, type!).

Section 2. BISTORTA L. Sp. Pl. 360 (1753); H. 31.

This group has been given generic rank by some authors, but the characters on which the separation is made are mainly those of root and stem form.

KEY TO SPECIES.

a. Plants shrubby, at least at the base: ocreae coarsely nerved; nerves often becoming excurrent....*b*
b. Inflorescence of twisted or curved spikes terminating the woody branches: leaves short-petiolate; blades ovate, 1 cm. long, entire; nerves not prominent..... 19. *P. vaccinifolium*

b. Inflorescence of cylindrical spikes borne on herbaceous branches from the woody base....*c*
c. Spikes solitary, terminal on erect branches, with reduced leaves, from the tufted base: leaf margins crenate with prominent nerve ends: spikes densely flowered..*d*
d. Leaf blades glabrous, narrowly spathulate, 4–10 cm. long and 6–12 mm. broad: flowering stalks leaf-bearing.....20. *P. affine.*
d. Leaf blades buff tomentose beneath, elliptic to elliptic-ovate, 12 cm. long and 6 cm. broad: flowering stalks nearly leafless.....21. *P. subscaposum.*
c. Spikes 1–5, axillary or terminal on slender weak branches from the trailing or creeping base: leaf margins entire, involute when young: spikes laxly flowered.....22. *P. emodi.*
a. Plants herbaceous: ocreae without coarse excurrent nerves....*e*
e. Stems branching....*f*
f. Ocreolae 5–7 mm. long: leaf blades 5–15 cm. long..23. *P. amplexicaule.*
f. Ocreolae 2–4 mm. long: leaf blades 2–10 cm. long....*g*
g. Upper leaves epetiolate, blades cordate and amplexicaul 26. *P. suffultum.*
g. Leaves with blades linear and tapering to the petiole. 24. *P. pamiricum.*
e. Stems simple....*h*
h. Stems usually 2–4 from one rootstock: ocreae 1–2 cm. long....*i*
i. Inflorescence included by blades of the upper cauline leaves.....25. *P. majanthemifolium.*
i. Inflorescence not at all included.....26. *P. suffultum.*
h. Stems usually single....*j*
j. Flowering stalk leafless or with 1 or 2 small leaves. 27. *P. tenuicaule.*
j. Flowering stalk leaf-bearing....*k*
k. Lower part of the inflorescence bulbil-bearing.28. *P. viviparum.*
k. Inflorescence not bulbil-bearing....*l*
l. Perianth 5–6 mm. long....*m*
m. Blades of the basal leaves oblong, not slenderly pointed....*n.*
n. Perianth deep crimson: spike rather laxly flowered: cauline leaves ovate....29. *P. calostachyum.*
n. Perianth rose-colored: spike densely flowered: cauline leaves lanceolate.....30. *P. coriaceum.*
m. Blades of the basal leaves lanceolate, slenderly pointed; petioles wing-margined above...31. *P. Milletii.*
l. Perianth 2–4 mm. long....*o*
o. Petioles more or less conspicuously wing-margined.....32. *P. Bistorta.*
o. Petioles not wing-margined....*p*
p. Stout plant with oblong or lanceolate leaf blades, at least at the base.....33. *P. macrophyllum.*
p. Dwarf alpine plant with narrowly linear leaf blades: perfect stamens 1–3....34. *P. perpusillum.*

19. **Polygonum vaccinifolium** Wall. Cat. n. 1695 (1828), nom. nud.; and ex Meisn. in W. Pl. As. Rar. iii. 54 (1832); H. 33; G. 393.

Bistorta vaccinifolia (Wall. ex Meisn.) Green, Leafl. i. 21 (1904).

A decumbent shrub: branches often trailing and bearing adven-

titious roots: leaves short-petiolate; the blades ovate to orbicular, sometimes glaucous beneath, 6–12 mm. across, margins entire: ocreae about 1 cm. long, lacerate and with many coarse excurrent nerves: inflorescence of several to many slender terminal spikes; spikes up to 8 cm. long, usually not over 1 cm. thick: flowers with pedicels slightly exserted from the ocreolae at maturity: perianth pink to rose-colored, 3–4 mm. long: stamens exserted.

The Himalayas.

BRITISH INDIA. Sikkim: *Clarke 9981-A* and *B* (US); *Hooker* (GH, NY, BS). Eastern Himalayas: *Cave* (BS). Nepal: *Scully* (US). Kumaon: *Strachey & Winterbottom* 3 (GH). Garhwal: *Duthie 4357* (US). Kashmir: *Parker* (AA—4 sheets). Himalayas: *Royle* (GH); *R. R. Stewart* (NY). Locality?: *Blinkworth* (M—3 sheets, C). Without Locality: *Falconer 841* (GH, T).

20. **Polygonum affine** D. Don, Prodr. Fl. Nep. 70 (1825); H. 33; G. 392.

P. viviparum Wall. ex D. Don, l. c., in syn.

P. Donianum Spreng. Syst. iv. Cur. Post. 154 (1827). *P. affine* D. Don is given as a syn.

P. Brunonis Wall. n. 1692 (1828), nom. nud.—acc. to H. l. c.

Bistorta affinis (D. Don) Greene, Leafl, i. 21 (1904).

A densely tufted glabrous perennial with erect herbaceous shoots growing from prostrate woody rootstocks: leaves sessile or nearly so, oblanceolate to linear, glabrous and sometimes glaucous beneath, tapering to the base; margins crenulate, nerves prominent: ocreae many-nerved, deeply cleft, 2–3 cm. long: inflorescence of terminal spikes 3–6 cm. long and 1.–1.5 cm. in diameter, solitary on erect rather slender branches with reduced leaves: flowers disjointing readily from the pedicels which are exserted from the ocreolae: perianth about 4 mm. long: achenes triangular.

The Himalayas and Tibet.

BRITISH INDIA. Nepal: *Lindley* (T). Kumaon: *Schlagintweit 9870* (GH); *Strachey & Winterbottom 2* (GH, M). Garhwal: *Dudgeon & Kenoyer 256* (MBG); *Schlagintweit 10014* (GH). Lahul: *Parker* (AA); *Schlagintweit 2879* (C), *3965* (GH). Kashmir: *Schlagintweit 12054* (C); *R. R. Stewart* (NY) and *3577* (UC, MBG). Chitral: *Barrett* (UC). Without Locality: *Falconer 842* (GH, T).

CHINA. Tibet: *Schlagintweit 6203* (M), *6594* and *6760* (GH), *6889* (M), *7328* (C); *T. Thomson* (GH).

21. **Polygonum subscaposum** Diels in Not. Bot. Gard. Edinb. V. xxv. 261 (1912).

P. taliense Lingelsh. in Fed. Rep. Beih. xii. 359 (1922).

Flowering stems 15–25 cm. high, nearly leafless, from a thickened caudex: basal leaves petiolate: leaf blades elliptic to elliptic-ovate,

buff-tomentose beneath, about 12 cm. long and 6 cm. broad, reticulate: spikes densely flowered, about 3 cm. long and 1.5 cm. thick; flowers deep rose.

Yunnan.

Not seen.

P. taliense is reported to differ from *P. subscaposum* by its smaller stature, more coriaceous leaf blades and thicker pedicels.

22. **Polygonum emodi** Meisn. in Wall. Pl. As. Rar. iii. 51 t. 287 (1832); H. 33; G. 393; S. 176.

P. Meisneri Wall. n. 1693 (1828), nom. nud.—acc. to H. l. c.

A prostrate shrub with rather elongated stoloniferous branches often rooting at the nodes: leaves more or less tufted on short branches, short-petiolate; blades lanceolate, entire, striately nerved, 3–7 cm. long; margins involute when young: ocreae membranous, deeply cleft, many-nerved, 1–2 cm. long: inflorescence of rather laxly-flowered spikes arranged terminally or from axils near the tips of the branches; spikes pedunculate, 2–4 cm. long: ocreolae brown, ovate, 3–5 mm. long: flowers on pedicels somewhat exceeding the ocreolae; perianth crimson, 3–4 mm. long, persistent and including at maturity the triangular shining achene.

The Himalayas.

BRITISH INDIA. Sikkim: *Hooker* (GH); *Smith & Cave 2643* (BS). Eastern Himalayas: *Cave* (BS). Kumaon: *Blinkworth* (US, M). Simla: *Drummond 1924* (UC). Himalayas: *Royle* (GH).
CHINA. Yunnan: *Schneider 1905* and *3675* (GH).

22a. **Polygonum emodi** Meisn. var. **dependens** Diels. in Not. Bot. Gard. Edinb. V. xxv. 256 (1912); S. 176.

P. zigzag Lévl. & Vant. in Fed. Rep. vi. 112 (211) (1908)—acc. to S. l. c.

Bistorta zigzag (Lévl. & Van.) H. Gross in B. G. B. xxiii. 19 (1913).

A larger plant with leaf blades 4–15 cm. long and often broadly lanceolate: ocreae 1.5–3.5 cm. long: spikes of the inflorescence 3–6 cm. long: ocreolae 4–6 mm. long: perianth 4–5 mm. long at maturity.

CHINA. Yunnan: *Ducloux 541* (GH, UC); *E. E. Maire 540–1914* and *7356-B* (UC, BS), *7464* (UC), *7474* (UC, US, BS), *7474-B* (GH, UC—2 sheets); *Rock 4662* (US, NY), *6446* (GH, UC, US, NY), *9873* (GH, UC, US); *Schneider 1853* (GH). Szechuan: *Forrest 11113* (UC).

One hesitates to support a variety which appears to differ from the type only in the larger size of its parts. It is hoped that further study will reveal other differences of diagnostic value which have not been found by the present writer or by the author of the variety.

23. **Polygonum amplexicaule** D. Don, Prodr. Fl. Nep. 70 (1825); F. & H. 333; G. 391; S. 176.

P. petiolatum D. Don, l. c.—acc. to H. 33.

P. speciosum Meisn. 66 (1826)—acc. to H. l. c.

P. oxyphyllum Wall. n. 1715 (1828), nom. nud.; and ex Meisn. in W. 54 (1832)—acc. to H. l. c.

Bistorta amplexicaulis (D. Don) Greene, Leafl. i. 21 (1904).

Bistorta oxyphylla (Wall. ex Meisn.) Greene, l. c. (1904).

Bistorta speciosa (Meisn.) Greene, l. c. (1904).

Erect herb from a thickened rhizome: branches several in a cluster, leafy, bearing a terminal spike and sometimes a few axillary spikes near the tips, 3–10 dm. tall: leaves long-petiolate below and sessile or amplexicaul above; blades ovate, glaucous beneath, the bases cuneate, truncate or cordate and the tips often long-acuminate, margins often crenulate with thickened vein tips: ocreae membranous, cleft, 2–4 cm. long: spikes long-pedunculate, densely flowered. 3–9 cm. long: flowers on slender pedicels, somewhat exserted from the ovate ocreolae; perianth white, pink or red, 3–5 mm. long; stamens exserted: achene triangular.

Temperate eastern Asia.

BRITISH INDIA. Bengal: *Clarke 13522-B* (US). Sikkim: *Clarke 10093-B* (US); *Hooker* (GH). Eastern Himalayas: *Cave* (BS—2 sheets). Nepal: *Lindley* (T); *Wallich 1716-1* (M). Kumaon: *Blinkworth* (US, C, M and 1 unmarked sheet from NY); *Strachey & Winterbottom 12* (GH, C), *13* and *14* (GH). *Garhwal: Harsukh* (UC); *King* (GH); *Schlagintweit* (GH), *162* (C). Simla: *Hawkes 54* (BS). Punjab: *Drummond 22675* and *26804* (UC). Chamba: *R. R. Stewart 2692* (MBG). Kashmir: *Clarke 138* (US); *Schlagintweit 3563* (US), *13209* (GH); *R. R. Stewart* (NY) and *4813* (UC), *5639* (NY). Northwestern Himalayas: *Dudgeon & Kenoyer* (MBG); *King* (US); *Mill* (GH); *T. Thomson* (GH, NY, BS); *United States Nat. Herb. 516654.* Locality?: *Jacquemont 1049* (BS).

AFGHANISTAN. *Aitchison 767* (GH).

CHINA. Yunnan: *E. E. Maire 6443* (UC), *6443-B* (BS); *Rock 5815* (GH, UC, US). Szechuan: *Schneider 1360* (GH). Shantung: *Maingay 98* (GH).

23a. **Polygonum amplexicaule** D. Don var. **sinense** Forbes & Hemsl. in Journ. Linn. Soc. xxvi. 333 (1891); Hook. Ic. Pl. xviii. t. 1743.

A weak-stemmed branching perennial herb from woody, more or less elongated rootstocks: stems glabrous, striate, 3–5 dm. tall: basal and lower cauline leaves long-petiolate, the upper gradually becoming amplexicaul; blades cordate-ovate to lanceolate, entire, up to 12 cm. long, reticulated but the margins not crenulate, glabrous, or minutely granulose beneath, the margins and upper surface, particularly the veins, often hirtellous: ocreae membranaceous, linear-lanceolate, up

to 5 cm. long: inflorescence of terminal or axillary spike-like panicles, rather lax and slender; panicles 4–8 cm. long, on slender peduncles about equalling or exceeding the length of the panicles; fascicles 2–3 per cm. of the axis, about 3-flowered, subtended and often more or less clasped by brownish membranaceous ovate to lanceolate sometimes hyaline-margined ocreolae 5–7 mm. long: flowers perfect; sepals 5, oblong-lanceolate; stamens 8, anthers exserted, filaments stout and persistent; styles 3 or 2; achene 3-angled, dark brown, opaque, the surface minutely roughened.

CHINA. YUNNAN: *Forrest 11032* (UC). HUPEH: *S. S. Chien 5532* (UC); *Henry 419* (GH—2 sheets), *2521* (GH, NY),[1] *6743* (GH, US); *E. H. Wilson 1478* (US, NY), *1593* (NY).

Related to *P. amplexicaule* D. Don and within the limits of that species as defined by Hooker (p. 32), but distinguished as follows:

1. Branching more freely above than the typical form of *P. amplexicaule*, but the specimens of the latter seen by the writer branch more or less and hardly seem to justify the description "tufted."
2. The leaf-margins of the variety are entire as contrasted with the often strongly crenulate leaf-margins of its relative. And the lower surfaces of the leaves of *P. amplexicaule* are generally hirtellous rather than glabrous or minutely granulose as in the Chinese variety.
3. The panicles are more numerous, and much more lax and slender than in the typical form of *P. amplexicaule*, in which they are mostly terminal and bear at least twice as many fascicles per cm. of the axis.
4. The ocreolae of this variety are not hyaline (except sometimes a narrow margin) nor acuminate, as in the related species, and in contrast to it, they usually clasp the fascicles.
5. The sepals are oblong-lanceolate in the flowers of the variety and broadly ovate in the typical form of *P. amplexicaule*.
6. The surfaces of the achenes in the former are opaque and in the case of the latter they are lustrous.

The name *sinense* was published by Forbes & Hemsley, l. c., who connect it by reference to Oliver's description in Hooker's Icones, l. c. Intermediate forms occurring in Szechuan and Yunnan make it seem best to consider the plant from Central China as a variety rather than a distinct species.

24. **Polygonum pamiricum** Korshin. in Mém. Acad. Sci. St. Pétersb. cl. Phys. et Math. ser. VIII. iv. No. 4, 98 (1896); Ostenfeld & Paulsen in Hedin, S. Thibet vi. pt. 3. 87.

[1] This number is cited in the description which accompanies the plate in Hook. l. c.

An herb with slender branching rhizomes giving rise to several unbranched or branching stems: leaf blades linear, 2–4 cm. long, tapering to the petioles: inflorescence of terminal subglobose spikes 6-8 mm. in diameter: perianth white or reddish at the base, about 2.5 mm. long: achene triangular.

Pamir plateau, Central Asia.

Not seen.

25. **Polygonum majanthemifolium** (V. Petr.) comb. nov.

Bistorta majanthemifolia V. Petr. in Bul. Jard. Bot. URSS. xxvii. 221 (1928).

Slender herb with creeping rhizomes: stems usually 3 or 4, ordinarily 15 cm. tall: inflorescence terminal and axillary, the terminal inflorescence small, subcapitate and included in the blades of the upper leaves: flowers erect, on slender pedicels.

China, Kansu Province.

Not seen.

26. **Polygonum suffultum** Maxim. in Mél. Biol. ix. 616 (1876); F. & H. 350; Mat. 62; Diels in Not. Bot. Gard. Edinb. v. 259; S. 176.

P. constans Cummins in Kew. Bul. 1896 p. 20—acc. to S. l. c.

P. Marretii Lévl. in Fed. Rep. viii. 171 (1910)—acc. to S. l. c.

Bistorta suffulta (Maxim.) Greene ex H. Gross in B. G. B. xxiii. 15 (1913).

P. Limprichtii Lingelsh. in Fed. Rep. Beih. xii. 359 (1922)—acc. to S. l. c.

Bistorta constans (Cummins) V. Petr. in Bul. Jard. Bot. URSS xxvii. 220 (1928).

Slender herb from a thickened rootstock producing 3 or 4 slender erect simple or somewhat branching stems 15–40 cm. tall: lower leaves long-petiolate, the upper amplexicaul: ocreae membranous, about 2 cm. long: spikes terminal or axillary, laxly or rather densely-flowered, ovoid to oblong: ocreolae ovate, 2–4 mm. long: stamens exserted: achenes triangular.

China and Japan.

CHINA. YUNNAN: *Rock 3764* (US, NY), *4154* (GH, UC, US). HUPEH: *Henry 1454* (US), *3727* and *4061-A* (GH), *5317* (NY); *E. H. Wilson 1069* (US, NY).

JAPAN. HONDO: *Maximowicz* (GH); *United States Nat. Herb. 44498, 1396960.* LOCALITY?: *Watanabe* (OA, US).

26a. **Polygonum suffultum** Maxim. var. **pergracile** (Hemsl.) Sam. in Hand.-Maz. Symb. Sin. vii. 176 (1929).

P. pergracile Hemsl. in F. & H. 344 (1891) [as *P. pergracilis*].

Bistorta pergracilis (Hemsl.) H. Gross in B. G. B. xxiii. 16 (1913).

A variety distinguished by its very slender, almost thread-like stems and more laxly flowered spikes.

Western China.

CHINA. SZECHUAN: *Faber 839* (NY).

27. **Polygonum tenuicaule** Biss. et Moore in Journ. Bot. 1878, p. 135; Mat. 63.

P. Bistorta L. var. *nanum* Maxim. ex V. Petr. in Bul. Jard. Bot. URSS xxvii. 226 (1928).

Bistorta tenuicaulis (Biss. et Moore) V. Petr. in l. c. (1928).

Low delicate herb from a thickened rootstock: branches usually single, leafless or with 1 or 2 reduced leaves: leaves radical, long-petiolate; blades broadly ovate to oblong or lanceolate, up to 4 cm. long: inflorescence a single terminal spike, laxly-flowered, 2–3 cm. long: perianth 3–4 mm. long: stamens exserted.

JAPAN. HONDO: *United States Nat. Herb. 1396959.* SHIKOKU: *Watanabe* (GH). KIUSIU: *Maximowicz* (GH, C). WITHOUT LOCALITY: *Hogg* (C).

28. **Polygonum viviparum** L. Sp. Pl. 360 (1753); F. & H. 352; G. 388; N. 13; Mat. 64; Hultén in Kungl. Sv. Akad. Handl. III. v. No. 2 p. 55 [Fl. Kamtch.]; S. 172.

Bistorta vivipara (L.) S. F. Gray, Nat. Arr. Br. Pl. ii. 268 (1821); Greene ex H. Gross in B. G. B. xxiii. 16.

P. angustifolium D. Don, Prodr. Fl. Nep. 70 (1825)—acc. to H. 31.

P. bracteatum Spreng. Syst. iv. Cur. Post. 154 (1827), based on *P. angustifolium* Don.

"*P. affine* Don," Wall. n. 1683 (1828), nom. nud., not of Don—acc. to H. l. c., where attributed to Don.

P. bulbiferum Royle ex Bab. in Trans. Linn. Soc. xviii. 94 (1838).

Bistorta bulbifera (Royle ex Bab.) Greene, Leafl. i. 21 (1904).

Erect herb from a thickened rhizome: basal leaves long-petiolate; those of the upper stem sessile; blades oblong to linear, bases acute to cordate, margins often crenulate with thickened vein tips: inflorescence a dense terminal spike, up to 10 cm. long and 15 mm. thick, the lower half bulbil-bearing: flowers pink; stamens included or exserted: achenes triangular or biconvex.

Temperate and arctic regions of the northern hemisphere.

BRITISH INDIA. SIKKIM: *Hooker* (GH). KUMAON: *Strachey & Winterbottom 5* (GH). GARHWAL: *Strachey & Winterbottom 6* (GH). PUNJAB: *Drummond 22205* (UC). KASHMIR: *R. R. Stewart 3558* (NY). HAZÁRA: *Inayat 20122-b* (UC). HIMALAYAS: *Duthie 24910* (UC); *Royle* (GH). WITHOUT LOCALITY: *Jacquemont 1016* (BS).

CENTRAL ASIA. ALA-TAU: *Ptaschicki 381* (BS).

SIBERIA. Transbaicalia: *Karo 250* (MBG). Irkutsk: *Krystofovic* (UC—2 sheets). Yakutsk: *Augustinowicz* (MBG). Kamchatka: *Stewart* (C). Okhotsk Sea: *Wright* (GH).

CHINA. Tibet: *Strachey & Winterbottom 4* (GH); *T. Thomson* (GH, M). Mongolia: *Chaney 239* (GH, UC, NY); *David 2766* (GH); *Gibler* (C). Manchuria: *Dorsett 3578* (UC). Szechuan: *W. P. Fang 4030* (NY). Kansu: *R. C. Ching 353* (GH). Shansi: *M. S. Clemens 8058a* (BS). Chihli: *J. C. Liu 1969* (UC). Hupeh: *C. F. Li 10864* (NY).

JAPAN. Hokkaido: *Arimoto* (GH, MBG); *Miyabe* (GH).

According to Babington, l. c. 95, *P. bulbiferum* "may be distinguished from its near ally *P. viviparum* by its fruit, the length of its filaments, and by the density of the seed-bearing part of its spike. In that plant the fruit is triquetrous, and its faces are ovate-lanceolate, smooth and shining, the filaments are twice as long as the calyx, and the whole spike is lax, slender, and elongated." But in his description Babington l. c. 94, says, "Fruit rather large, lenticular, compressed, the faces nearly round and pointed, rather opaque and minutely granulate-striate; the fruit of the trigonous flowers is probably 3-gonal, but none of such occurs in our specimens." Hooker f. p. 32, describes *P. viviparum* as with "Nut very small, trigonous or biconvex," and includes *P. bulbiferum* as a synonym.

29. **Polygonum calostachyum** Diels in Not. Bot. Gard. Edinb. v. 261 (1912); S. 175.

P. kermesinum F. K. Ward in Trans. Bot. Soc. Edinb. xxvii. 26 (1916), nom. nud.—acc. to S. 175.

Herb from a thickened caudex which is covered with brown scales: branches erect, bearing a single spike at the tip and about 3 somewhat reduced leaves: leaves mostly basal, petiolate; blades rather coriaceous, glaucous and somewhat pubescent beneath, elliptic, 10–15 cm. long, margins crenulate; cauline leaves with petioles united to the cylindric ocreae, blades ovate, often cordate at the base and the upper ones nearly sessile: spike 3–5 cm. long: flowers on slender pedicels, exserted from the ocreolae: perianth about 6 mm. long, dark red.

High mountains of southeastern Asia.

CHINA. Yunnan: *Rock 10059* (UC).

30. **Polygonum coriaceum** Sam. in Hand-Maz. Sym. Sin. vii. 174 (1929).

A species related to *P. macrophyllum* but clearly separated by the larger perianth (5–6 mm. long) and greater average height (3–6 dm.).

Known only from southwestern China.

CHINA. Yunnan: *Forrest 5812* (UC); *Rock 3341* (UC), *5679* (GH, NY); *Schneider 3442* (GH).

31. **Polygonum Milletii** Lévl. in Fed. Rep. xii. 286 (1913), in syn. and Cat. Pl. Yun. 207 (1916); S. 175.

"*P. sphaerostachyum* Meisn." Hook. f. in Bot. Mag. t. 6847 (1885).

Bistorta Milletii Lévl. in Fed. l. c. (1913).

Flowers unusually large (perianth about 6 mm. long) pendulous on long slender pedicels, so giving a drooping appearance to the inflorescence, and deep crimson in color: petioles not usually broadly winged, but the leaf-blades tapering to the petioles.

Growing at high elevations in the Himalayas.

CHINA. YUNNAN: *Rock 4966* (GH, UC); *Schneider 1814* (GH).

There has been much confusion between *P. Bistorta* on the one hand and *P. macrophyllum* or *P. sphaerostachyum* on the other, but the relationship between Hooker's plate (Bot. Mag. l. c.) and Rock's specimens seems quite clear. Hooker has evidently misunderstood Meisner's *P. sphaerostachyum* which is clearly represented by authentic specimens cited under *P. macrophyllum*. Before seeing Professor Samuelsson's identification of Léveillé's *P. Milletii* the writer was treating this plant as a variety of *P. Bistorta* and it is suggested that the specimens cited show by their tendency towards winged petioles, a close relationship with that species.

32. **Polygonum Bistorta** L. Sp. Pl. 360 (1753); F. & H. 334; G. 390; N. 13; Mat. 55; Hultén in Kungl. Sv. Akad. Handl. III. v. No. 2 p. 52 [Fl. Kamtch.].

Bistorta vulgaris Hill, Brit. Herb. 488 (1756)—acc. to H. Gross in B. G. B. xxiii. 16.

P. ellipticum Willd. ex Spreng. Syst. ii. 253 (1825)—acc. to M. in DC. 125.

P. paleaceum Wall. n. 1684 (1828), nom. nud.; and ex Meisn. in W. 54 (1832), nom. nud.; H. 32 (1836). *P. confusum* is given as a syn.

P. confusum Meisn. in Wall. 53 (1832); F. & H. 336—acc. to Meisn. in DC. 125=var. *angustifolium*.

P. carneum C. Koch inLinnaea xxii. 197 (1849) –acc. to F. & H. l. c.

P. splendens Klotzsch ex Meisn. in DC. 126 (1856), in syn. = var. *angustifolium*.

Bistorta confusa (Meisn.) Greene, Leafl. i. 21 (1904).

Bistorta chinensis H. Gross in B. G. B. xxiii. 18 (1913)—acc. to S. 173 = *P. paleaceum*.

Bistorta yunnanensis H. Gross in op. cit. 19 (1913)—acc. to S. 173 = *P. paleaceum*.

P. yunnanensis (H. Gross) Lévl. Cat. Pl. Yun. 208 (1916)—acc. to S. 173 = *P. paleaceum*.

P. sinomontanum Sam. in Hand.-Maz. Symb. Sin. vii. 177 t. III. Abb. 6 (1929).

Perennial herb from thick hard twisted rhizomes: stems simple, bearing few to several leaves topped by a single spike: basal leaves long-petiolate, the upper stem leaves sessile or clasping; blades oblong to linear, extending downward into a winged petiole, reduced in size upward and with increasingly tapering tips: ocreae membranous, tubular: inflorescence a single rather densely-flowered spike up to 6 cm. long and 1.5 cm. in diameter: flowers exserted from the ovate ocreolae on slender pedicels; perianth white or pink, about 3 mm. long: achene triangular.

Temperate and alpine regions of the northern hemisphere.

CENTRAL ASIA. TURKESTAN: *Knorring 1090* (BS).
SIBERIA. IRKUTSK: *Adrianow* (C); *Krystofovic* (UC). PRIMORSKAYA: *Arsenev* (BS); *Buxton* (NY). AMUR: *Korshinsky* (GH); *Topping 2131* (US).
CHINA. SUNGARIA: *Schrenk* (GH). MONGOLIA: *Gibler* (C); *Ledebour* (MBG). MANCHURIA: *Dorsett 3320* (UC); *Wilford* (GH). SHANSI: *M. S. Clemens 8058* (BS); *Han 62* (UC); *K. Ling 1906* (UC). CHIHLI: *J. C. Liu 680* (UC, NY). SHANTUNG: *M. S. Clemens 1367* (BS); *K. K. Tsoong 5009* (UC).
JAPAN. SHIKOKU: *Watanabe* (GH). LOCALITY?: *Tanaka 200270* (UC).
WITHOUT LOCALITY: *Faurie 3594* (BS).

The leaf characters of *P. Bistorta* appear to vary so as to include *P. sinomontanum*. The writer has seen only the illustration cited above, which does not appear to differ materially from such specimens as that of Watanabe in the Gray Herbarium, from Japan.

33. **Polygonum macrophyllum** D. Don, Prodr. Fl. Nep. 70 (1825); Bab. in Trans. Linn. Soc. xviii. 95.

P. tenue D. Don, l. c. (1825), not of Michx.—acc. to M. 53 = *P. sphaerostachyum.*

P. sphaerostachyum Meisn. 53 (1826). *P. macrophyllum* is given as a syn. by M. in DC. 125 and H. 32.

P. stenophyllum Meisn. 52 (1826)—acc. to H. l. c.

P. gracillimum Spreng. Syst. iv. Cur. Post. 154 (1827)—acc. to H. l. c.

P. hayachinense Mak. in B. M. T. xvii. 191 (1903)?

Bistorta sphaerostachya (Meisn.) Greene, Leafl. i. 21 (1904).

Bistorta stenophylla (Meisn.) Greene, l. c. (1904).

Bistorta hayachinensis (Mak.) H. Gross in B. G. B. xxiii. 16 (1913).

Perennial herb from a thickened rootstock producing several leafy shoots: basal leaves long-petiolate, blades oblong to lanceolate, up to 20 cm. long: leaves of the upper stem sessile, blades lanceolate to linear, glaucous or pubescent beneath, up to 10 cm. long; margins often made crenulate by thickened tips of the veins: inflorescence

solitary and terminal, densely flowered, about 8–15 mm. thick and up to 10 cm. long: ocreolae ovate to lanceolate, cuspidate from a strong central vein: perianth pink, 2.5–5. mm. long.

The Himalayas.

BRITISH INDIA. ASSAM: *Clarke 38481* (C); *Hooker & Thomson* (GH, C). SIKKIM: *Hooker* (GH, NY, BS). EASTERN HIMALAYAS: *Cave* (BS—2 sheets); *Griffith 4119* (GH). NEPAL: *Wallich 1683-4* (M—2 sheets, C). GARHWAL: *Strachey & Winterbottom 1* (GH). NORTHWESTERN HIMALAYAS: *T. Thomson* (GH).

CHINA: YUNNAN: *Henry 9685* and *9685-A* (NY); *E. E. Maire 127-1914* (BS), *6345* (UC), *6345-B* (GH, UC, BS); *Rock 5728* (GH, NY), *6004* and *10729* (UC); *Schneider 2206* and *3318* (GH). KANSU: *R. C. Ching 537* (GH, UC), *1050* (UC). HUPEH: *Henry 6956* (GH); *E. H. Wilson 2186* and *2392* (NY). LOCALITY?: *Henry 685-A* (NY).

This species has been considered under the name *P. sphaerostachyum* by Meisn. l. c., but in the Prodromus he follows the citation of *P. macrophyllum* as a synonym by the statement, "nomen omnino ineptum." He appears, then, to reject the earlier name because it does not seem appropriately descriptive. It is true that most of the earlier collections of the species were without the comparatively large basal leaves which are shown so clearly in the specimens secured by more recent collectors. It would seem that even the reason given by Meisner for his rejection of *P. macrophyllum* does not hold and certainly the rules of nomenclature do not support this discrimination. Several authentic specimens from the Meisner Herbarium leave little doubt as to the identity of this species. They do not, however, conform to Hooker's plate (Bot. Mag. t. 6847) which seems rather to represent a relative of *P. Bistorta*. Much variation in size of spike and of perianth occurs among the specimens cited above, but satisfactory distinctions for the establishment of varieties have not as yet been worked out. No specimens of *P. hayachinense* have been examined. From the description the plant is not separable from *P. macrophyllum*, though that species is not otherwise known from Japan. The problem presented by *P. Bistorta* and its near associates in eastern and central Asia requires further study and more complete material than is now available.

34. **Polygonum perpusillum** Hook. f. Icon. Pl. xv. t. 1490 (1885); and Fl. Br. Ind. v. 32; G. 389.

Bistorta perpusilla (Hook. f.) Greene, Leafl. i. 21 (1904).

A much-dwarfed perennial herb from a thickened rhizome: leaves narrowly linear, obtuse, 1–5 cm. long; margins recurved: spikes solitary, ovoid to oblong, up to 1 cm. long, on a slender 1-leaved peduncle usually overtopped by the basal leaves: flowers pink, with 1–3 perfect stamens (acc. to Hook. f.).

Alpine Himalayas.

BRITISH INDIA. Sikkim: *Hooker 38* (GH). Kumaon: *Strachey & Winterbottom 39* (GH).
CHINA. Yunnan: *Forrest 19728* (UC).

It is perhaps, questionable whether the specimen from China is of the same species as those from India. The former is two or three times larger and the inflorescences are more compact.

Section 3. PERSICARIA L. Sp. Pl. 360 (1753) [including *Amblygonon* Meisn. Monogr. 43, 53 (1826)].

The species of these two sections have been combined in the key which follows because there did not appear to be suitable characters on which to separate them without dissection of the seeds. Danser (p. 143) has combined the two under § *Persicaria* because, having examined a quantity of seeds of species belonging to § *Amblygonon*, he found that the diagnostic character of incumbent cotyledons was exceedingly variable.

Key to Species.

a. The tubular ocreae with an herbaceous limb at the top, at least when young....*b*
  b. Plants 1–3 m. tall, soft-hairy; stems branching: leaves long-petiolate; blades many-nerved, ovate, up to 2 dm. long; ocreae not saccate; herbaceous limb 5–6 mm. long, sometimes deciduous: ocreolae chartaceous, densely hairy: achenes black and shining, depressed on both surfaces.....35. *P. orientale.*
  b. Plants up to 1.4 m. tall, glabrous or pubescent; stems simple and very stout: leaves epetiolate; blades lanceolate, tapering to a narrow base, 5–10 cm. long: ocreae saccate and strongly nerved below the attachment of the leaves; herbaceous limb 3–4 mm. long: ocreolae membranaceous, many-nerved, ciliate .....36. *P. limbatum.*
a. Ocreae tubular, membranous, ciliate or not: plants glabrous or pubescent....*c*
  c. Ocreae eciliate (very finely ciliate in some forms of *P. lapathifolium*)....*d*
    d. Spikes of the inflorescence densely conical, ovoid or short-cylindrical, borne separately or in pairs: plants perennial, amphibious, sparsely branching and rooting at the nodes: floating leaves petiolate; blades oblong to elliptical, up to 15 cm. long; aerial leaf-blades lanceolate, usually smaller.....37. *P. amphibium.*
    d. Spikes of the inflorescence arranged in terminal and axillary panicles, slender and more laxly flowered: plants terrestrial, profusely branching: leaf-blades lanceolate....*e*
      e. Plant entirely glabrous (except in var. *scabrinervis* where the midveins of the leaves are scabrid beneath), sometimes glaucous: inflorescences of a few coarse spikes up to 10 cm. long.....38. *P. glabrum.*
      e. Plants more or less pubescent, scabrid, or tomentose....*f*
        f. Achenes unequally biconvex or plano-convex....39. *P. javanicum.*

f. Achenes flat on both sides or slightly concave....*g*
g. Achenes 1.5–2 mm. in diameter: spikes of the inflorescence up to 10 cm. long, often drooping ..... 40. *P. lapathifolium.*
g. Achenes 2-3 mm. in diameter: spikes not over 5 cm. long, erect..... 41. *P. scabrum.*
c. Ocreae ciliate (eciliate in some forms of *P. tinctorium*)....*h*
h. Plant (except the flowers) scabrous with long spreading hairs; stems and peduncles viscous, glandular-hairy.. 42. *P. viscosum.*
h. Plants glabrous or pubescent, sometimes scabrid with short appressed hairs or the peduncles glandular-hairy....*i*
i. Leaves distinctly petiolate....*j*
j. Leaf blades oval to broadly lanceolate, bluish green ....*k*
k. Coarse erect plant: leaf blades oval to oblong, not sharply pointed, up to 10 cm. long: inflorescence often of dense clusters..... 43. *P. tinctorium.*
k. Slender prostrate plant: leaf blades lanceolate, tapering to both ends, 2–5 cm. long: inflorescence of slender panicles..... 44. *P. assamicum.*
j. Leaf blades lanceolate-acuminate, cuneate at the base, 8–15 cm. long: inflorescence spicate: leaves and upper stems densely tomentose; ocreae densely topped with short cilia....*l*
l. Achenes strongly biconvex..... 45. *P. tomentosum.*
l. Achenes weakly biconvex, plano-convex or not at all convex ....*m*
m. Achenes flattened or weakly biconvex....46. *P. celebicum.*
m. Achenes plano-convex..... 47. *P. attenuatum.*
i. Leaves scarcely or not at all petiolate....*n*
n. Inflorescence rather dense and continuously cylindrical....*o*
o. Ocreae bearing coarse bristles two-thirds as long as the tube or longer; leaf blades coriaceous, 4–10 cm. long....*p*
p. Perianth glandular-dotted..... 48. *P. macranthum.*
p. Perianth eglandular....*q*
q. Spikes of the inflorescence rather densely flowered; perianth about 2 mm. long: achenes triangular: bristles mostly longer than the tube of the ocrea..... 49. *P. barbatum.*
q. Spikes of the inflorescence rather laxly flowered; perianth 2.5–6 mm. long: achenes triangular or biconvex: bristles usually shorter than the tube of the ocrea....50. *P. japonicum.*
o. Ocreae without very coarse long bristles: leaf blades membranous, smaller and varying in form from lanceolate to ovate....*r*
r. Pedicels of the flowers long-exserted from the ocreolae....*s*
s. Flowers short-cylindric, 4–5 mm. long....51. *P. longiflorum.*
s. Flowers campanulate, 2–3 mm. long....52. *P. jucundum.*
r. Pedicels not long-exserted....*t*
t. Margins of the ocreolae ciliolate (glabrous in some forms of *P. Persicaria*): perianth ovoid....*u*

u. Achenes 1.5 mm. or less broad: leaf blades lanceolate: inflorescence densely flowered; perianth up to 2 mm. long....*v*

v. Coarse erect herb: leaf blades lanceolate, tapering to both ends, up to 15 cm. long: spikes of the inflorescence 4–8 cm. long: flowers quickly deciduous; pedicels about as long as the ocreolae
53. *P. borneense.*

v. Rather slender herb: leaf blades linear lanceolate, up to 8 cm. long: spikes of the inflorescence 2–3 cm. long.....60. *P. minus.*

u. Achenes 2–3 mm. broad: leaf blades broadly lanceolate: inflorescence heavy; perianth 2–4 mm. long.....54. *P. Persicaria.*

t. Ocreolae glabrous, or nearly so: perianth campanulate.....55. *P. Poirettii.*

n. Inflorescence laxly flowered or usually so and often elongated....*w*

w. Perianth conspicuously glandular-punctate....*x*

x. Achenes finely reticulate or striate....*y*

y. Inflorescence of a few to several slender spikes; some of the flowers and fruits often included within the swollen foliar ocreae: achenes lenticular or triangular.....56. *P. Hydropiper.*

y. Inflorescence a single elongated spike terminating the branch: none of the foliar ocreae including or subtending flowers or fruits: achenes triangular.....57. *P. pubescens.*

x. Achenes smooth and shining....*z*

z. Branches prostrate at the base: leaves ovate (or broadly lanceolate).....58. *P. odoratum.*

z. Branches erect: leaves (usually narrowly) lanceolate.....59. *P. punctatum.*

w. Perianth eglandular: achenes smooth and shining....*a*

a. Achenes mostly biconvex (often triangular in *P. minutulum*)....*b*

b. Inflorescence spiciform, sometimes interrupted below.....60. *P. minus.*

b. Inflorescence diffused, paniciform, fascicles much scattered on very slender axes..61. *P. minutulum.*

a. Achenes triangular....*c*

c. Stem excurrent: plant erect, 5–10 dm. high.62. *P. excurrens.*

c. Stems deliquescent: plants prostrate to suberect, 1–6 dm. high....*d*

d. Ocreolae rose-colored at the top: flowers closely arranged.....63. *P. limicola.*

d. Ocreolae entirely green: flowers often openly arranged.....64. *P caespitosum.*

35. **Polygonum orientale** L. Sp. Pl. 362 (1753); F. & H. 343; G. 386; N. 5; C. 37; Mat. 60; Mer. in Journ. Straits Br. Roy. As. Soc. 1921 p. 245 and Enum. 123; Dan. 168; S. 177.

Lagunea cochinchinensis Lour. Fl. Cochinchin. 220 (1790)—acc. to H. 30.

P. altissimum Moench. Meth. 630 (1791). *P. orientale* is given as a syn.

P. speciosum Salisb. Prodr. 259 (1796), based on *P. orientale*.

P. amoenum Blume, Bijdr. 531 (1825)—acc. to Dan. l. c.

P. cochinchinense (Lour.) Meisn. 55 (1826) = *P. orientale* b. *pilosum* M. in DC. 123.

P. pilosum Roxb. Fl. Ind. ii. 286 (1832). *Laguna cochinchinensis* is given as a syn.

Persicaria orientalis (L.) Spach, Syst. Veg. x. 537 (1841).

P. torquatum De Bruyn in Miq. Pl. Jungh. 303 (1854)—acc. to Dan. l. c.

P. subcordatum Miq. Journ. Bot. Néerl. Ind. i. 95 (1861).

P. Spaethii Dammer in Notizbl. Konigl. Bot. Gart. Berlin ii. 378 (1899)—acc. to S. l. c.

P. tibeticum Rendle in Journ. Bot. 1900, p. 428, not of Hemsl., replaced by the following.

P. Deasyi Rendle, op. cit. 495.

Amblygnum orientale (L.) Nakai in Mori, Enum. Pl. Cor. 129 (1922).

Amblygonon pilosum (Meisn.) Nakai in Sasaki, List Pl. Form. 168 (1928)—name only.

A branching densely villous annual, 1–3 m. tall: leaves long-petiolate; blades ovate, acuminate, up to 20 cm. long, the bases tapering to the petioles or sometimes cordate: ocreae shortly ciliate, expanded into an herbaceous wing above, which is often deciduous from the older nodes of the branch: inflorescence of fairly dense axillary or terminal spikes 2–8 cm. long: ocreolae oblique, densely pubescent and coarsely ciliate, bearing 2–6 flowers in a fascicle: flowers exserted on jointed pedicels not all of one fascicle maturing together: perianth white or pink, enclosing at maturity the orbicular, somewhat flattened achene: achene about 3 mm. broad; surfaces black and shining.

Southern and eastern Asia, the Philippines and the East Indies.

BRITISH INDIA. Bengal: *Clarke 33495* (C); *Helfer 34* (US); *Griffith 4118* (GH); *T. Thomson* (GH, US). Assam: *Jenkins* (GH); *Mokim* (US); *De Silva* (US—2 sheets). Kashmir: *Schlagintweit 2975* and *3303* (GH), *3440* (US), *4458* (C). Northwestern Himalayas: *T. Thomson* (GH). Locality?; *Kuntze 5517* (NY).

CHINA. Tibet: *Schlagintweit 863* (US, M?). Yunnan: *Henry 13201* (NY); *E. E. Maire 370* (UC), *395-1914* and *526-1914* (BS), *6456* (UC), *6456-B* (BS), *7479* (GH, UC), *7484* (UC), *7484-B* (BS); *Rock 11558* (UC, US); *Schneider 2741* (GH, US). Chihli: *M. S. Clemens 1774* and *1774a* (BS). Hupeh: *Henry 1668* (GH, US); *E. H. Wilson 1409* (US, NY). Anhwei: *R. C. Ching 4334* (UC, US), *4636* (GH, UC, US); *McClure 3361* (UC). Kiangsu: *K. Ling 2597* (GH); *Merrill 11401* (BS); *Univ. Nanking 226* (UC, MBG, US, BS). Chekiang: *Barchet 593* (US). Kwangtung: *Krone Herb.*, photo (GH); *Levine* [*CCC 811*] (GH, MBG, US, BS); *To* and *Fuson* [*CCC 2980*]

(BS). HONGKONG: *Wright* (C). HAINAN: *Ford* (MBG); *McClure 1076* (MBG, BS); *S. T. Wu 1121* (UC).

KOREA. *Gilbert 123* (UC).

JAPAN. SHIKOKU: *Watanabe* (GH). KIUSIU: *Oldham 691* (GH, M). WITHOUT LOCALITY: *O. Ames Herb.; Hilgendorf* (BS); *Herb. Lugd.-Bat.* (GH), *16* (M?), *205* (NY); *United States Nat. Herb. 1396938.*

FORMOSA. *Faurie 772* (BS); *Ford*—locality? (MBG); *Henry* (MBG, US); *Nakahara 360* (BS); *Oldham 423* (GH); *Sasaki 171* (UC).

FARTHER INDIA. INDO-CHINA: *McClure 748* (BS); *Petelot 90* (US—2 sheets, BS), *96* (US, BS). BURMA: *A. Huk 80* (GH).

PHILIPPINES. MINDANAO: *M. S. Clemens* (BS); *Fenix* [*PBS 26110*] (UC, US, BS). LUZON: *L. Parker 49* (BS).

EAST INDIAN ISLANDS. BORNEO: *Korthals 121* (M). JAVA: *Blume 102* (US); *Hallier 308* (UC); *Kuntze 5502* (NY); *de Vriese 100* (NY).

P. subcordatum is separated only on the form of the leaf base which is said to be more or less cordiform. Leaf blades with bases tapering to the petiole, or truncate or somewhat cordiform may all occur on the same specimen, e. g. *United States Nat. Herb. 1396938.* Some of these leaf bases are hardly less cordiform than those appearing in the type of *P. subcordatum*, a photograph of which has been seen through the kindness of Dr. E. D. Merrill. *P. Deasyi* is distinguished as a smaller plant with unbranched stem and almost sessile spike. The writer has seen no specimens.

36. **Polygonum limbatum** Meisn. in DC. Prodr. xiv. 123 (1856); H. 30; G. 387.

An herb with stout simple erect stems: leaf blades lanceolate, tapering into the short petioles: ocreae somewhat swollen, bearing a strigose-ciliate herbaceous limb at the top. Habit, inflorescence and achene of *P. tomentosum.*

Distributed through India, Egypt and tropical Africa.

BRITISH INDIA. MALABAR: *Stocks etc.* (GH). BENGAL: *T. Thomson* (GH, C).

37. **Polygonum amphibium** L. Sp. Pl. 361 (1753); F. & H. 333; G. 394; Koid. in Journ. Col. Sci. Tokyo xxvii. Art. 13. p. 50; Mat. 55; Hultén in Kungl. Sv. Akad. Hand. III. v. No. 2 p. 50 [Fl. Kamtchat.]; S. 177.

Persicaria amphibia (L.) S. F. Gray, Nat. Arr. Br. Pl. ii. 268 (1821).

Persicaria amurensis Nieuwland in Amer. Midl. Nat. ii. 183 (1912).

An exceedingly variable aquatic or amphibious perennial with stout creeping stems which root at the nodes: leaves long-petiolate, often floating; blades elliptic to oblong or lanceolate, 5–12 cm. long, usually obtuse or rounded at the apex, rounded to subcordate at the base. inflorescence of pedunculate spikes borne singly or in pairs: spikes cylindric or ovoid, 2–4 cm. long, densely flowered: perianth pink or white, 3–5 mm. long.

Northern Eurasia and North America.

BRITISH INDIA. KUMAON: *Strachey & Winterbottom 26* (GH, M). KASHMIR: *R. R. Stewart 3230* (NY).
AFGHANISTAN. *Griffith 4114* (GH).
SIBERIA. YENISEISK: *Schipchinsky 494* (UC). IRKUTSK: *Kryschtofowitsch* (UC). AMUR: *Korshinsky* (GH, US). SAKHALIN: *Glehn* (GH, M).
CHINA. SUNGARIA: *Schrenk* (GH). MONGOLIA: *Chaney 316* (GH, UC). YUNNAN: *Ducloux 537* (GH, UC); *E. E. Maire 144* (BS), *360* and *7343* (GH, UC), *7343-B* (US, BS), *7467* (UC, US, BS), *7467-B* (GH, UC); *Rock 5034* (UC, US). CHIHLI: *M. S. Clemens 1773, 1773a, 8055* and *8055a* (BS); *Wickes 40* (UC). SHANTUNG: *Wickes 216* (UC).
JAPAN. HOKKAIDO: *Miyabe* (GH).

Persicaria amurensis is distinguished by conspicuous vegetative characters, but the fact that intermediate conditions are found, particularly in the variation of the size and form of the leaf base, indicate that it can hardly be considered a distinct species.

37a. **Polygonum amphibium** L. forma **terrestre** (Leers) Blake in Rhodora xv. 164 (1913); Moss, Camb. Br. Fl. ii. 115.

P. amphibium var. b. *terrestris* Leers ex Willd. Sp. Pl. ii. 443 (1799).

A terrestrial form in which the branches are erect, bearing lanceolate acutely tipped scabrid leaves.

CHINA. TIBET: *Schlagintweit 825* (GH, US). SUNGARIA: *Schrenk* (GH). CHIHLI: *M. S. Clemens 8062* and *8062a* (BS).

This form is less common than the typical floating plant and appears superficially to differ widely from it.

38. **Polygonum glabrum** Willd. Sp. Pl. ii. 447 (1799); F. & H. 340; G. 393; C. 30; Mer. 122.

"*P. Persicaria L.*" Wall. n. 1720 (1828)—acc. to H. 34.

An erect usually glabrous herb about 1 m. tall: leaves short-petiolate; blades rather narrowly lanceolate, glabrous or the midrib scabrid beneath, 10–20 cm. long: ocreae membranous, tubular, eciliate, about 3 cm. long: inflorescence a few-branched panicle of slender spikes; spikes densely flowered, 6–10 cm. long: ocreolae rounded, rarely ciliolate; flowers on jointed pedicels, easily deciduous: perianth about 3 mm. long: achenes biconvex, black and shining, 1.5–2 mm. broad.

Old World tropics.

BRITISH INDIA. CEYLON: *Thwaites 2907* (GH); *Walker etc.* in part (GH). MADRAS: *Narayama* (UC). MYSORE: *G. Thomson* (GH, M). BOMBAY: *Kuntze 7562* (NY). CENTRAL PROVINCES: *Clarke 33871-B* (C); *Duthie 9711* (UC). KUMAON: *Strachey & Winterbottom 25* (GH). OUDE: *Wallich* (T). PUNJAB: *Ridley* (BS); *Schlagintweit 2580* (US), *10190* (GH); *R. R. Stewart 438* (MBG, NY). HIMALAYAS: *Royle* (GH). LOCALITY?: *Herb. Hamilton* (C); *Schweinfurth* (GH). WITHOUT LOCALITY: *Wight 10* (M), *2455* (T) and (NY, BS).
CHINA. KWANGTUNG: *Levine & Groff [CCC 113]* (BS); *Tsang & Wong 2557* (UC). HAINAN: *McClure 2470* (OA, MBG, BS).

JAPAN. Liu Kiu: *Herb. Univ. Tokyo* (BS)?
FORMOSA. *Faurie 757* (BS); *Henry 271* (MBG), *349-A* (NY), *1192* (MBG); *Sasaki 698* (UC).
FARTHER INDIA. Indo-China: *Kuntze ?706* (NY); *Petelot 281* (BS); *C. B. Robinson 1192* (BS). Siam: *Hosseus 31a* (MBG). Burma: *Wallich 1711-2* (M).
PHILIPPINES. Luzon: *Elmer 5970* (US, NY, BS); *Loher 4595* (US, BS); *Merrill 7783* (US, BS).

38a. **Polygonum glabrum** Willd. var. **scabrinervis** Hook. f. Fl. Br. Ind. v. 34 (1886).

P. quadrifidum Hamilt. ex Meisn. in Wall. 56 (1832)—acc. to H. 34.

A form with the habit and inflorescence of *P. glabrum*, but with the midveins of the leaves scabrid beneath.

Southeastern Asia.

FARTHER INDIA. Burma: *Wallich 1711/2* (M).

39. **Polygonum javanicum** De Bruyn in Miq. Pl. Jungh. 303 (1854); Dan. 159 f. 4.

P. robustum Meisn. in Miq. Ann. Lugd.-Bat. ii. 60 (1865–66)—acc. to Dan. l. c.

A species intermediate between *P. glabrum*, from which it differs by not being wholly glabrous, and *P. lapathifolium* from which it differs in having coarser stems and larger fruit.

Java.

Not seen.

40. **Polygonum lapathifolium** L. Sp. Pl. 360 (1753); F. & H. 342; G. 395; N. 9; Koid. in Journ. Col. Sci. Tokyo xxvii. Art. 13 p. 50; C. 34; Mat. 59; Dan. 185; S. 177.

P. nodosum Pers. Syn. Pl. i. 440 (1805) = *P. lapathifolium* L. var. *nodosa* acc. to H. 35.

P. glandulosum R. Br. Prodr. 419 (1810)—acc. to Dan. l. c.

Persicaria lapathifolia (L.) S. F. Gray, Nat. Arr. Br. Pl. ii. 270 (1821).

P. nutans Roxb. Fl. Ind. ii. 285 (1832) = *P. lapathifolium* L. var. *laxa* acc. to H. l. c.

P. simlense Royle ex Bab. in Trans. Linn. Soc. xviii. 102 (1838)—acc. to Ind. Kew.

Persicaria nodosa (Pers.) Opiz. Seznam 72 (1852).

P. quadrifidum Hamilt. ex Meisn. in DC. 122 (1856) = *P. lapathifolium* L. var. *laxa* acc. to H. l. c.

P. pyramidale Lévl. in Bul. Soc. Bot. Fr. liv. 370 (1907)—acc. to S. l. c.

Persicaria Vaniotiana Lévl. in Fed. Rep. xi. 496 (1913)—acc. to S. l. c.

Persicaria lapathifolia (L.) A. Gray ex Nakai, Fl. Quelpaert Is. 41 (1914).

P. Vaniotiana Lévl. Cat. Pl. Yun. 208 (1916). *Persicaria Vaniotiana* is given as a syn.

Persicaria Krugii H. Gross & Loesen. in Loesen. in Beih. Centralbl. xxxvii. 112 t. iv. A (1919).

P. pseudo-nodosum Ohki in B. M. T. xxxix. 263 (1925).

Persicaria pseudonodosa (Ohki) Sasaki, List Pl. Form. 170 (1928).

An erect branching annual .5–2.5 m. tall, glabrous or somewhat appressed-scabrid: nodes of the stem often swollen: leaves subsessile; blades lanceolate: ocreae sometimes sparingly ciliate, tubular, about 2 cm. long: spikes slender, drooping or nodding, 2–6 cm. long, densely flowered: flowers greenish white or pink; perianth about 2 mm. long, strongly nerved: achenes lenticular, 1.5–2 mm. long, smooth and shining at maturity.

Widely distributed.

BRITISH INDIA. Bengal: *T. Thomson* (GH). Kumaon: *Strachey & Winterbottom 24* (GH, C). Punjab: *T. Thomson* (GH). Kashmir: *Schlagintweit 4459* (US); *R. R. Stewart 3234* and *3242* (NY). Himalayas: *Royle* (GH).

CENTRAL ASIA. Karkaralinsk: *Kutscherovskaja 1695* (BS).

SIBERIA. Irkutsk: *Krystofovic* (UC—2 sheets); *Tugarinowa* (UC). Amur: *Korshinsky* (US); *Topping 2364* and *2474* (US). Sakhalin: *Augustinowicz* (BS); *F. Schmidt* (GH). Locality?; "Turga Rock"; *Bohnhof 137* and *173* (NY).

CHINA. Tibet: *Schlagintweit 826* (US), *6865* (GH). Mongolia: *Chaney 336* (UC, NY), *424* (GH, UC). Yunnan: *Henry 10802* (NY—2 sheets); *E. E. Maire 149, 349, 352, 354, 355, 358* and *6196* (UC), *6707-B* (UC, BS), *7364* (GH, UC), *7364-B* (BS—2 sheets), *7480* (UC), *7494* (GH, UC, US), *7494-B* (UC, US, BS). Szechuan: *W. P. Fang 3492* (NY). Chihli: *M. S. Clemens 1774-b, 8060, 8060-a* and *8061* (BS); *J. C. Liu 1296, 1503* and *2024* (UC); *S. W. Williams* (GH). Shantung: *Reymond 144* (BS); *Wickes 241* (UC); *Zimmermann 242* (GH, US). Hupeh: *Henry 2407* (GH); *C. F. Li 11161* (NY). Anhwei: *R. C. Ching 4238* and *4625* (UC, US); *A. N. Steward 1309* (UC). Kiangsu: *Allison 30* (GH); *H. T. Chang 299* (UC); *H. T. Feng 30* (UC); *K. Ling 2384* (GH, UC); *Merrill 11408* (BS). Chekiang: *Barchet 549* (US); *C. Y. Chiao 1052* (UC); *K. K. Tsoong 4329* (BS). Fukien: *H. H. Chung 3006* (GH, UC); *Fukien Chr. Univ. 11003* and *12400* (UC); *Metcalf 414* and *421* (UC). Kiangsi: *N. K. Ip 1802* (BS). Kwangtung: *W. Y. Chun 163* (UC); *Dunn* [*HH 6361*] (BS); *Levine* [*CCC 3390*] (GH, MBG—2 sheets BS); *S. W. Williams 184* (T). Hainan: *McClure 2471* (OA, BS); *K. K. Tsoong 1061* (BS).

KOREA. *Gilbert 121* and *141* (UC).

JAPAN. Hokkaido: *Brooks 384* (GH, UC); *Maximowicz* (GH, C); *Herb. Sapporo Agr. Col.* (GH). Hondo: *Faurie 4230* and *4232* (BS); *Iishiba* (UC—3 sheets); *Maximowicz* (US); *Savatier 1028* (US); *United States Nat. Herb. 1396939; Watanabe* (GH, OA, US—2 sheets). Kiusiu: *Tanaka 100275* (UC—2 sheets, US). Without Locality: *Herb. O. Ames; Herb. Lugd.-Bat.* (GH) and *13* (C), *19* (NY), *207* (M); *Oldham* (GH); *Herb. Univ. Tokyo* (BS).

FORMOSA. *Faurie 4218* (BS); *Sasaki 700* and *21619* (UC).

FARTHER INDIA. Indo-China: *Petelot 91* (US, BS), *282* (BS).

P. Krugii appears to be separated from *P. lapathifolium* on the presence of ciliated ocreae. One of the two specimens of Zimmermann 242 examined has weak cilia bordering the top of the ocreae, but none have been found on the other specimen. Both Boissier (Fl. Orient. iv. 1030) and Hooker f. (p. 35) describe *P. lapathifolium* as sometimes having sparsely ciliated ocreae, while Ledebour's description reads "ocreis integris" (p. 521). *P. pseudo-nodosum* is said to differ from *P. nodosum* "by the absence of hooked nerves on the calyx."

40a. **Polygonum lapathifolium** L. var. **salicifolium** Sibth. Fl. Oxon. 129 (1794); Fernald in Rhodora xxiii. 259.

P. nodosum Pers. var. incanum Ledeb. 521 (1846–51).

Distinguished from the typical form of *P. lapathifolium* by having the leaf blades woolly-tomentose beneath and glabrous or nearly so above.

Widely distributed, especially in subtropical and temperate regions.

BRITISH INDIA. ASSAM: *Wallich* (C).
SIBERIA. AMUR: *Maximowicz* (GH).
CHINA. TIBET: *Schlagintweit 829* (GH, US, C), *5319* (UC, US, M), *6158* (GH, C). SUNGARIA: *Schrenk* (GH). YUNNAN: *E. E. Maire 368* and *1558* (UC), *6181* (GH, UC, BS); *Schoch 62* (US). SZECHUAN: *Faber 857* (US); *Schneider 1599* (GH). KANSU: *R. C. Ching 317* (GH, UC). SHANSI: *C. O. Lee* [*UN 6102*] (UC); *K. Ling 1878* (UC). CHIHLI: *M. S. Clemens 8064*, *8064a* and *8064b* (BS); *J. C. Liu 775* and *1323* (UC). ANHWEI: *Griffing* [*UN 2962*] (UC). KIANGSU: *H. T. Chang 294* (UC); *Deschamps* (US); *H. T. Feng 134* (GH); *H. Q. Fu 6* (BS); *Maingay 464* (GH, T). CHEKIANG: *Barchet 550* (US); *H. H. Hu 1446* (BS); *Y. L. Keng 560* (UC). FUKIEN: *H. H. Chung 1182*, *1426* and *1759* (UC); *Fukien Chr. Univ. 2312* and *11996* (UC). KIANGSI: *Bailey* (GH); *A. N. Steward 633* (MBG, UC, BS). KWANGTUNG: *Dunn* [*HH 5804*] (BS); *Faber* (NY); *Groff* [*CCC 2285*] (BS); *Hance 10984* (GH); *Y. Tsiang 130* (UC); *Wang 560* (UC).
JAPAN. HOKKAIDO: *Miyabe* (GH). HONDO: *United States Nat. Herb. 1396956; Watanabe* (GH—2 sheets). KIUSIU: *Tanaka 186* (US), *200513* (UC).
FORMOSA. *Faurie 770* (BS).
FARTHER INDIA. INDO-CHINA: *O. Kuntze* (NY); *Squires 409* (GH, NY). BURMA: *Wallich 1717* (M).
EAST INDIAN ISLANDS. JAVA: *Danser 6715* (UC); *Herb. Lugd.-Bat. 31* (NY).

The name *P. incanum* Schmidt has been wrongly used under *P. lapathifolium* and correctly appears under *P. scabrum* Moench according to Fernald, l. c. There is no indication that Ledebour's variety *incanum* was based upon Schmidt's name.

40b. **Polygonum lapathifolium** L. var. **lanatum** (Roxb.) comb. nov.

"*P. lanigerum* R. Br." of Asiatic authors = *P. lapathifolium* acc. to Dan. 185–7.

P. glutinosum Wall. n. 1717 (1828), nom. nud.; ex Meisn. in W. 55 (1832) = *P. lapathifolium* acc. to Dan. l. c.

P. lanatum Roxb. Fl. Ind. ii. 285 (1832) = *P. lanigerum* acc. to H. 35.

P. arachnoideum Klotzsch ex Meisn. in DC. 117 (1856) = *P. lanigerum* b. *indicum*.

P. bioritsuense Ohki in B. M. T. xxxix. 259 (1925).

Persicaria bioritsuensis (Ohki) Sasaki, List Pl. Form. 168 (1928).

Plant distinguished from the typical form of *P. lapathifolium* by being densely lanate.

This variety appears to be particularly abundant in the tropical and subtropical regions of the eastern hemisphere.

BRITISH INDIA. BENGAL: *Griffith 4107* (C); *T. Thomson* (GH). SIKKIM: *Kuntze 6600* (NY). NEPAL: *Wallich* (C—2 sheets) and 1714-2 (M). ROHILKUND: *Wallich* (T) and *1714-1* (M). KUMAON: *Strachey & Winterbottom 15* (GH). PUNJAB: *Drummond 26781* and *26796* (UC). NORTHWESTERN HIMALAYAS: *T. Thomson* (GH, NY). WITHOUT LOCALITY: *Falconer 839* (GH).

FORMOSA. *Faurie 771* (BS); *Henry 349* (NY), *583* (MBG, NY); *Kawakami & Nakahara 706* (BS); *Kobayasi 695* (UC); *Univ. Tokyo* (BS). LOCALITY?: *Tokyo* (BS).

FARTHER INDIA. BURMA: *Huk 67* (US).

PHILIPPINES. LUZON: *J. Clemens* (UC); *Cuming 1377* (MBG, BS); *Mearns* [*PBS 2262*] (BS); *Ramos* [*PBS 7902*] (US, BS); *Topping 875* (US).

EAST INDIAN ISLANDS. JAVA: *Kuntze 5503* (NY).

Danser, l. c., states that all the Asiatic specimens he has seen named *P. lanigerum* are hardly separable from *P. lapathifolium*. While in agreement with this, the writer has found a fairly clear geographic range for the so-called "*P. lanigerum*," and has here placed it as a variety. Examination of African specimens labelled *P. lanigerum*, and very distinct from *P. lapathifolium*, has led to the belief that in Africa and Australia there is another plant to which R. Brown's description applies and which should be called *P. lanigerum*. This plant is much coarser than *P. lapathifolium*. In accordance with the descriptions of *P. lanigerum* found in Australian floras the perianth is glandular dotted, while that of *P. lapathifolium* is not. Also the achenes of *P. lanigerum* are 3 mm. or more broad, while those of *P. lapathifolium* are 1.5–2 mm. across.

41. **Polygonum scabrum** Moench, Meth. 629 (1794); Fernald in Rhodora xxiii. 259.

P. persicaria subsp. *tomentosa* Schrank, Baier, Fl. i. 669 (1789)—acc. to Fernald, l. c.

P. incanum Schmidt, Fl. Boem. iv. 90 (1794)—acc. to Fernald, l. c.

P. lapathifolium var. *incanum* Koch, Syn. Fl. Germ. 617 (1837), based on *P. incanum* Schm.

P. tomentosum Schrank ex Schmidt, l. c., in syn., validated by Gürke, Richt. Pl. Eur. ii. 121 (1897), not of Willd.

Persicaria tomentosa (Schrank) Bicknell in Bul. Torr. Bot. Club xxxvi. 453 (1909).

Persicaria lapathifolia (L.) S. F. Gray subsp. *genuina* (Gren. & Goder.) H. Gross var. *tomentosa* (Schuster) H. Gross in Loesen. in Beih. Centralbl. xxxvii. 2. 113 (1919), based on *P. tomentosum* Schrank.

A simple-stemmed or somewhat branching annual: leaves short-petiolate; blades lanceolate to oblong, 4–10 cm. long, at least some of them flocculent-tomentose beneath and all finely glandular-dotted: inflorescence a few terminal or axillary densely flowered spikes up to 4 cm. long and 1.5 cm. thick borne on finely glandular peduncles: achenes flattened, about 3 mm. broad, smooth and shining, included at maturity in the greenish perianth.

Europe, eastward to Siberia and naturalized in North America.

SIBERIA. Tomsk: *Kloptov 733* (UC).

42. **Polygonum viscosum** Hamilt. ex D. Don, Prodr. Fl. Nep. 71 (1825); F. & H. 352; G. 397; N. 10; C. 26; Mat. 64; Dan. 144; S. 178.

P. hirsutum Hamilt. ex Meisn. in DC. 103 (1856), in syn.

P. strigosum Hamilt. ex Hook. f. 36 (1886), not of R. Br., in syn.

P. viscoferum Mak. in B. M. T. xvii. 115 (1903).

Persicaria Kukenthalii Lévl. in Fed. Rep. xii. 286 (1913), in syn. = *P. Kukenthalii*—acc. to S. l. c.

Persicaria viscofera (Mak.) Gross ex Nakai, Fl. Quelpaert Is. 42 (1914).

Persicaria viscosa Gross ex Nakai, l. c. (1914).

Persicaria Makinoi Nakai in Cat. Sem. Hort. Tokyo, 1920, p. 34.

P. Makinoi Nakai, l. c. (1920), in syn.

A branched strigose ascending annual: leaves short-petiolate; blades lanceolate: ocreae many-nerved and profusely ciliate: spikes of the inflorescence slender, not densely flowered, 2–5 cm. long, on slender usually glandular peduncles: ocreolae rounded, glandular and strigose: flowers red; pedicels jointed; fruits easily deciduous; achenes triangular, black at maturity, about 3 mm. long and equaling the perianth.

Southeastern Asia.

BRITISH INDIA. Bengal: *Griffith 4116* (GH, T). Assam: *Chatterjee* (GH); *Gammie 156* (BS); *Hooker & Thomson* (GH, M); *Wallich* (M). Nepal: *Wallich 1713* (M—2 sheets). Locality?: *Herb. Hamilton* (M).

CHINA. Yunnan: *Henry 12220* (US, NY); *E. E. Maire 147* (UC, BS). Hupeh: *Henry 2785* (GH—2 sheets). Kiangsu: *Univ. Nanking 102* and *232* (BS). Chekiang: *R. C. Ching 4967* (UC). Fukien: *Fukien Chr. Univ. 3849* (UC). Kwangtung: *Groff 241* (UC); *Hance 1028* (GH); *Levine* [*CCC 929*] (GH, MBG, US, BS).

JAPAN. Hondo: *United States Nat. Herb. 1396932.* Without Locality: *Herb. Lugd.-Bat. 15* and *184* (C), *198* (NY).

The descriptions of *P. viscoferum* and *P. Makinoi* do not indicate characters by which these species may be separated from *P. viscosum*, but *P. Makinoi* is said to differ from *P. viscoferum* by its narrow glabrous leaves and lax green flowers.

43. **Polygonum tinctorium** Ait. Hort. Kew. ii. 31 (1789); Lour. Fl. Cochinchin. 241 (1790); F. & H. 351; N. 11; C. 25; Mat. 63.

Pogalis tinctoria (Ait.) Rafin. Fl. Tellur. iii. 15 (1836).

Ampelygonum tinctorium (Ait.) Lindl. ex Steud. Nom. ed. 2. i. 79 (1840).

Persicaria tinctoria (Ait.) Spach. Syst. Veg. x. 536 (1841).

An erect herb, sparsely branching above the base: leaves short-petiolate; blades oval to oblong, usually drying with a bluish green color: ocreae tubular, ciliate: inflorescence a terminal panicle; spikes often more or less clustered; some branches of the panicle arising in the axils of the upper leaves; ocreolae rounded, ciliolate, 3–5-flowered: achenes ovate, biconvex, 2–3 mm. long, included in the perianth.

Cultivated in Asia.

CHINA. Shansi: *M. S. Clemens 8051* (BS). Chihli: *Skatschkow* (C)
JAPAN. Hokkaido: *Maximowicz* (T). Hondo: *Iishiba* (UC—2 sheets in part). Kiusiu: *Maximowicz* (GH, US); *Oldham 692* (GH). Without Locality: *Herb. O. Ames; Herb. Lugd.-Bat.* (GH), *6* and *191* (M), *202* (NY), *202x* (C); *United States Nat. Herb. 693952* and *1396958.*

The leaves of this plant are the source of a blue dye.

44. **Polygonum assamicum** Meisn. in DC. Prodr. xiv. 111 (1856); H. 36; G. 397.

A prostrate branching herb, glabrous except for the scabrous ocreae, petioles and nerves of the leaf blades: leaves petiolate; blades broadly lanceolate, bluish green when dried: ocreae tubular, ciliate: inflorescence slender, not densely flowered: achenes biconvex.

Northern India and western China.

BRITISH INDIA. Assam: *Wallich* (M). Sikkim: *Herb. Gray.*
FARTHER INDIA. Indo-China: *Petelot 448* (BS), *3273*, *3278* and *3281* (UC).

45. **Polygonum tomentosum** Willd. Sp. Pl. ii. 447 (1799); H. 30; G. 387; C. 36. Mer. 124.

"*P. ochreatum* L." Houtt. Nat. Hist. viii. 467 t. 49 f. 1 (1777) = *P. pulchrum*—acc. to Dan. 157.

P. pulchrum Blume, Bijdr. ii. 530 (1825). *P. tomentosum* is given as a syn. by Dan. l. c.

P. Bellardi Blanco, Fl. Filip. ed. 1. 314 (1837), not of All.—acc. to Mer. l. c.
"*P. orientale L.*" F.-Vill. Nov. App. 172 (1880)—acc. to Mer. l. c.
P. Cumingianum Gandoger in Bul. Soc. Bot. Fr. lxvi. 224 (1919).
Persicaria tomentosa (Willd.) Sasaki, List Pl. Form. 170 (1928).

Plant erect: stem simple, stout, glabrous or pubescent: leaves short-petiolate; blades lanceolate-acuminate, 8–15 cm. long, silky-tomentose beneath, pubescent above: ocreae tubular, truncate, striate, pubescent, densely ciliate at the top: inflorescence a terminal few-spiked panicle; spikes 3–8 cm. long, on stout peduncles: ocreolae oval at the top, strigose, several-flowered: flowers on jointed pedicels, early deciduous; perianth 2.5–3. mm. long: achene biconvex, black and shining, 2.–3.5 mm. broad.

Tropical regions of the eastern hemisphere.

BRITISH INDIA. Ceylon: *Thwaites 2248* (GH). Madras: *Wight 8* (M, C). Mysore: *G. Thomson* (GH). Bengal: *Griffith 4117* (GH); *T. Thomson* (GH, M). Without Locality: *Herb. Heyne* (US); *Wallich 1709-D* (M).

CHINA. Hongkong: *Kuntze 3557* (NY).

FARTHER INDIA. Indo-China: *Petelot 93* (BS). Siam: *Hosseus 31b* (M). Burma: *S. Mokim 835* (BS); Wallich *1709-4* (M). Locality?: *Thorel* (BS).

PHILIPPINES. Luzon: *L. Clemente 5775* (BS); *Cuming 627* (MBG, BS); *Elmer 18142* (GH, UC, MBG, US, BS); *Loher 4606* (US, BS); *McGregor 2904* (BS); *Malvar 267* (BS); *Merrill 97* (BS), [*Sp. Bl. 191*] (GH, OA, MBG, US, BS), *4242* and *5012* (US, NY, BS); *A. la Paz 5233* (BS); *Ramos* [*PBS 7868*] (BS); *Ramos & Edano* [*PBS 36726*] (BS); *C. B. Robinson* [*PBS 6529*] (BS); *Robinson & Ramos* [*PBS 11872*] (BS); *Salvoza etc.* [*PFB 29084*] (BS); *R. S. Williams 2061* (GH, US, NY—2 sheets, BS). Palawan: *Merrill 9465* (UC, US, BS). Mindanao: *C. B. Robinson* [*PBS 11592*] (BS).

EAST INDIAN ISLANDS. Sumatra: *Korthals 137* (M). Java: *Blume 115* (M); *Kuntze 4197* (NY); *Schulte* (BS).

Danser, l. c., uses *P. pulchrum* Bl. for this species, considering *P. tomentosum* Willd. invalid because of the supposedly earlier *P. tomentosum* Schrank. However, Fernald[1] has shown that Schrank's use of *P. Persicaria* * *tomentosum*[2] is as a subspecies or variety. *P. tomentosum* Schrank ex Schmidt[3] was not validated by Gürke[4] until 1897 and hence does not antedate *P. tomentosum* Willd. *P. Cumingianum* is differentiated largely on the quality of the pubescence of leaves and ocreae, and is based upon Cuming n. 627 which appears to be a sheet of mixed material (in MBG Herb.) and a part of which is not separable from *P. tomentosum*.

[1] Fernald in Rhodora xxiii. 259 (1921).
[2] Schrank, Baier. Fl. i. 669 (1789).
[3] Schmidt, Fl. Boem. iv. 90 (1794).
[4] Gürke, Richt. Pl. Eur. ii. 121 (1897).

46. **Polygonum celebicum** (Meisn.) Danser in Bul. Jard. Bot. Buit. viii. 165 f. 6 (1927).

P. attenuatum var. *celebicum* Meisn. in Miq. 60 (1865–66).

A species very closely allied to *P. tomentosum*, but distinguished by having the achenes weakly or not at all convex and with nearly glabrous ocreolae with ciliolate margins. These characters vary so as to suggest that the plant may possibly deserve varietal rather than specific designation.

The Philippines, the East Indian Islands and New Guinea.

EAST INDIAN ISLANDS. Borneo: *Endert 1487* (UC). Celebes: *Herb. Lugd.-Bat. 50* (M).

47. **Polygonum attenuatum** R. Brown, Prodr. Fl. Nov. Holl. 420 (1810); Dan. 162, f. 5.

P. australe Spreng. Syst. ii. 258 (1825)—acc. to Dan. l. c.

Also closely allied to *P. tomentosum*, differing in having plano-convex achenes.

Australia to the East Indian Islands.

Not seen.

48. **Polygonum macranthum** Meisn. in DC. 107 (1856); H. 40.

P. japonicum Meisn. var. *conspicuum* Nakai, p. 10. (1908).

P. japonicum Meisn. var. *densiflorum* Nakai, p. 11. (1908).

P. conspicuum Nakai, in Journ. Col. Sci. Tokyo xxxi. 168 (1911) [Fl. Kor. ii.].

Persicaria conspicua "conspicuum" Nakai in Mori, Enum, Pl. Cor. 131 (1922).

An erect coarse herb: leaves short-petiolate; blades lanceolate, 5–15 cm. long: ocreae strigose, long-ciliate: flowering spikes rather stiff, 4–8 cm. long; ocreolae imbricated, ciliolate: flowers exserted; perianth 3–4 mm. long, glandular-dotted, including the triangular smooth black achene at maturity.

BRITISH INDIA. Bengal: *Griffith 4109* (GH). Assam: *Clarke 44720-D* (C); *Hooker & Thomson 21* (GH, C); *Masters* (GH). Without Locality: *Griffith* (GH).

CHINA. Yunnan: *E. E. Maire 143* (UC, BS), *6454* (GH, UC), *6454-B* (BS); *Schneider 2785* (GH). Hupeh: *Henry 2261* (US). Anhwei: *R. C. Ching 4623* (GH, UC, US).

JAPAN. Hondo: *United States Nat. Herb. 44489* and *1396971; Watanabe* (GH—2 sheets, OA, US). Kiusiu: *Tanaka 200368* (UC). Without Locality: *United States Nat. Herb. 206138.*

There has been much confusion in the material under *P. japonicum* and the differences, other than the presence or absence of glands on the perianth, between *P. macranthum* and *P. japonicum* are not very easily defined. Since Meisner's description of *P. japonicum* (in DC.

112) says "calycibusque eglandulosis," it has seemed best to separate Nakai's glandular varieties *conspicuum* and *densiflorum*. Under *P. japonicum* Nakai's var. *conspicuum* is described with inserted styles and var. *densiflorum* is characterized by exserted styles. As indicated in the discussion under *P. barbatum*, the writer doubts the diagnostic value of exserted or inserted styles or stamens in § *Persicaria*. The specimens of *P. macranthum* from British India have generally longer cilia on the ocreae than occur on the Chinese and Japanese plants, but there do not appear other differences on which to separate them.

48a. **Polygonum macranthum** Meisn. var. **scabridum** var. nov. [Plate II.]

Planta robusta: caulibus plerumque simplicibus valde foliosis dense adpresso-strigosis; foliis sessilibus subcoreaceis lanceolatis integerrimis, supra et subtus adpresso-strigosis; ocreis tubulosis strigosis et longe ciliatis; spicis 4–10 densifloris recurvatis 4–10 cm. longis; pedunculis strigosis; ocreolis scabridulis ciliolatis; floribus exsertis longe pedicellatis; perianthio breviter cylindrato 3 mm. longo.

A stout plant with usually simple densely leafy and apressed-strigose stems: leaves sessile, subcoriaceous, lanceolate, entire, adpressed-strigose above and beneath, 4–10 cm. long; ocreae tubular, strigose and long-ciliate; tube about 2 cm. long, twice the length of the cilia or less: inflorescence of 4–10 densely flowered recurved spikes 4–10 cm. long: peduncles strigose; ocreolae scabridulous, ciliolate: flowers on long pedicels exserted 1–2 mm. beyond the ocreolae: perianth oblong, deeply 5-cleft, finely glandular-punctate: styles (in the type specimen) 2, equal in length to the perianth: stamens about 6, included in the perianth.

FORMOSA. *Faurie 766* (BS), type!

This variety resembles *P. pseudojaponicum* Ohki which is separated from *P. japonicum* on the uncertain character of included styles; but our plant has a glandular perianth, so indicating its affinity for *P. macranthum* from which it differs in having stouter densely leafy and strigose stems and peduncles, scabrid ocreolae and densely arranged short-cylindric (rather than campanulate) flowers

49. **Polygonum barbatum** L. Sp. Pl. 362 (1753); F. & H. 334; G. 397; C. 27; Mat. 55; Mer. in Philipp. Journ. Sci. ix. C. 80; Journ. Straits Br. Roy. As. Soc., 1921 p. 244 and Enum. 122; Dan. 145; S. 178.

P. gramineum Noronha in Verh. Batav. Genoot. v. ed. 1. Art. iv. 25 (1790), nom. nud.—acc. to Ind. Kew.

P. rivulare Roth, Nov. Pl. Sp. 206 (1821)—acc. to Ind. Kew.

P. fissum Blume, Bijdr. 532 (1825)—acc. to Dan. l. c.

P. rivulare Koen. ex Roxb. Fl. Ind. ii. 290—acc. to H. 37.
Pogalis barbata (L.) Rafin. Fl. Tellur. iii. 15 (1836).
P. stoloniferum Blanco, Fl. Filip. ed. 1. 314 (1837)—acc. to Mer. l. c.
"*P. Persicaria* L." Walp. in Nov. Act. Acad. Caes. Leop. Nat. Cur. xix. Suppl. i. 407 (1843), not of Linn.—acc. to Mer. l. c.
P. Manoraene Hamilt. ex Endl. Gen. Suppl. IV. ii. 47 (1847), in syn.
P. Raptae Hamilt. ex Endl. l. c. (1847), in syn.
"*P. Hamiltonii* Spreng." Meisn. in DC. 104 (1856).
P. erythrodes Miq. Fl. Ind. Bat. Suppl. 365 (1860)—acc. to Dan. l. c.
P. strigillosum Zipp. ex Meisn. in Miq. 57 (1865–6), in syn.
P. fluviatile Hamilt. ex Hook. f. l. c. (1886), in syn.
P. Marmoramae Hamilt. ex Hook. f. l. c. (1886), in syn.
P. kotoshoense Ohki in B. M. T. xxxix. 262 (1925).
P. omerostromum Ohki, l. c. (1925).
P. luxurians Dan. 198 (1927) = *P. barbatum* × *pulchrum*.
Persicaria flaccida (Roxb.) Nakai in Sasaki, List. Pl. Form. 169 (1928).
Persicaria kotoshoense (Ohki) Sasaki, l. c. (1928).
Persicaria omerostromum (Ohki) Sasaki op. cit. 170 (1928).

An ascending herb, more or less pubescent, 3–6 dm. tall: leaf blades lanceolate, acuminate, tapering to the base but scarcely petiolate: ocreae tubular, coarsely ciliate; the cilia usually longer than the tube: spikes rather densely flowered, 2–10 cm. long; ocreolae glabrous, margins ciliate; flowers and fruits early deciduous; perianth about 2 mm. long, eglandular: achenes triangular, included.

Tropics of the eastern hemisphere.

BRITISH INDIA. CEYLON: *Thwaites 3000* (GH). MADRAS: *Anglade 594* (UC); *Herb. Wight* (US). MYSORE: *G. Thomson* (GH). CENTRAL PROVINCES: *Clarke 33862-B* (C); *Wood* (US). BENGAL: *Griffith* (GH); *Kuntze 6592* (NY); *T. Thomson* (GH, M); *Wallich 1708-3* (US—2 sheets). ASSAM: *Mann* (BS). SIKKIM: *Schlagintweit 12720* (GH—in part). NEPAL: *Wallich* (GH, T). KUMAON: *Blinkworth* (M); *Strachey & Winterbottom 18* and *19* (GH). PUNJAB: *Drummond 26813* (UC); *T. Thomson* (GH). WITHOUT LOCALITY: *Herb. Heyne* (M); *Wallich 1708-5* (M); *Herb. Wight 8* (NY), *9* (US), *2454* (GH).

AFGHANISTAN. *Griffith 4115* (T).

CHINA. YUNNAN: *Henry 10383* (NY), *12667* (US). FUKIEN: *H. H. Chung 262* (BS), *1065* (UC). KWANGTUNG: *Levine* [*CCC 1134*] (GH, MBG, US—2 sheets, BS), [*CCC 1424*] (GH, MBG, US, BS); *McClure 2319* (BS); *Merrill 10875* (UC, BS); *Tsang & Wong 2335* (UC). HAINAN: *McClure 3064* (BS); *Moninger 90* (BS); *Tsang 403* and *666* (UC).

FORMOSA. *Henry* (US, NY), *1121* and *1286* (MBG, NY); *Kobayasi 701* (UC); *Nakahara* (US); *Oldham 426* (GH); *Sasaki 21530* (UC).

FARTHER INDIA. INDO-CHINA: *Colani* [*Petelot 3275*]; *Kuntze 3658* (NY); *Petelot 792* (BS), *3271* (UC); *Squires 31* (NY); *Thorel* (BS). SIAM: *Rock 1017* (US, BS). BURMA: *Brandis 1400* (GH); *Burmann* (US); *A. Huk* (GH); *Kuntze 6297* (NY); *Kurz 528* (GH). MALAY PENINSULA: *Herb. Bur. Science; Burkill 497, 2790* (BS); *Porter* (M); *Schlesisch Bot. Tausch. 843* (BS).

PHILIPPINES. Luzon: *Baeani* [*PFB 15905*] (BS); *Bona 87* and *385* (BS); *M. S. Clemens 16711* (UC)?; *Edano* [*PBS 26910*] (UC, US, BS); *Elmer 5679* (US, NY, BS), *15415* (UC, MBG, US, BS); *Fenix* [*PBS 12650*] (BS); *Goder 2, 40* (BS); *Hallier* (BS); *Lete 160* (UC), *501* (BS); *Loher 4599* (US); *McGregor 1350* (BS); *Mangubat 272* (US, BS); *Merrill 151, 1445* and *1610* (US, BS), [*Sp. Bl. 141*] (GH, OA, MBG, US, BS); *Otanes* [*PBS 17751*] (US, BS); *Ramos* [*PFB 7002*] (US, NY, BS); *Ramos & Edano* [*PBS 45238*] (UC); *C. B. Robinson* [*PBS 6006*] (BS); *Tirona 253* (BS); *Vanoverbergh 1181* (BS), *17699* (UC); *R. S. Williams 1991* (NY). Mindoro: *Mearns* [*PBS 2376*] (BS); *Merritt 441* and *591* (BS); *Ramos* [*PBS 39686*] (BS). Alabat: *Ramos & Edano* [*PBS 48324*] (UC, BS). Leyte: *Piper 598* (BS). Negros: *Merrill 210* (US, BS). Cebu: *Barrow 3* (BS). Bohol: *Ramos* [*PBS 42843*] (UC, BS). Mindanao: *M. S. Clemens* (BS); *Copeland* (BS), *358* (US, NY, BS); *DeVore & Hoover 117* (US, BS). Without Locality: *Cuming* (US); *Marave 141* (BS).

EAST INDIAN ISLANDS. Borneo: *M. S. Clemens 9768* (UC); *Korthals* (GH). Sumatra: *Bartlett & La Rue 50* and *324* (GH, UC, US, BS); *Korthals* (GH), *136, 144, 147* and *152* (M); *H. C. Robinson & Kloss* (US); *Yates 641* (UC—2 sheets). Java: *Blume 110* (M); *Herb. Lugd.-Bat. 37, 85* and *110* (M); *Kuntze 4940* (NY); *v. Leeuwen 11405* and *11944* (UC); *Merrill* (US); *de Vreise* (M); *Winckel 1443-B* (UC). Amboina: *C. B. Robinson 1667* (GH, MBG, US, BS).

According to Franchet, l. c., *P. barbatum* and *P. stagninum* are distinguished from *P. Myosurus* by their more slender spikes and more scattered flowers. The writer has seen no specimens of the last-named species. *P. kotoshoense* is described as "near *P. barbatum* L., but differs from it in having hairy stems." *P. omerostromum* is stated to be "near *P. kotoshoense* Ohki, but differs from it in having exserted stamens and inclused styles." This may prove to be a case of polymorphic flowers such as has been described by Standord (in Rhodora xxvii. 44) in other species of § *Persicaria*. No specimens of *P. omerostromum* have been seen. *P. barbatum* varies greatly in the size and comparative breadth of the leaf blades as well as in amount of pubescence and denseness of the spikes.

49a. **Polygonum barbatum** L. var. **stagninum** (Hamilt. ex Meisn.) comb. nov.

"*P. tomentosum* Willd." Wall. n. 1709–4 (1828) in part—acc. to H. 37, where attributed to Wall.

P. conspersum Meisn. in Wall. 56 (1832)—acc. to H. 37.

P. stagninum Hamilt. ex Meisn. in Wall. 56 (1832)

P. Hornemanni Meisn. in DC. 107 (1856)—acc. to H. l. c., in syn.?

P. Bishirae Hamilt. ex Hook. f. l. c., in syn.

P. Goyalpara Hamilt. ex Hook. f. l. c., in syn.

This variety differs from the type in being more tomentose. Following the suggestion of Gage (p. 398) the specimens cited below have been separated because of their tomentose ocreolae, whereas those of typical *P. barbatum* are glabrous, though they may be ciliate on the margins.

BRITISH INDIA. Bengal: *Clarke 7515* and *17240-D* (US); *Wallich 1709-1* (M). Oudh: *Harsukh (Duthie's collector) 22741-C* (UC).
FARTHER INDIA. Burma: *Wallich 1709-4* (M). Siam: *Groff [CCC 6112]* (BS).

49b. **Polygonum barbatum** L. var. **gracile** (Danser) comb. nov.

P. flaccidum Roxb. Fl. Ind. ii. 291 (1832), not of Meisn.—acc. to Dan. 146 = ssp. *gracile.*

"*P. serrulatum* Lagasc." Hook. f. 38 (1886)—acc. to Dan. l. c. = ssp. *gracile.*

P. barbatum L. ssp. *gracile* Dan. 146 f. 2 (1927); S. 178.

This variety is characterized by weak slender stems and usually by short flowering spikes which occur in clusters of 2 or 3 at the tip of a branch.

Southeastern Asia.

BRITISH INDIA. Garhwal: *Duthie 26000-a* (UC). Punjab: *Drummond 26789* (UC); *T. Thomson* (M); Kashmir: *Schlagintweit 5129* (M). Northwestern Himalayas: *T. Thomson* (GH).
SIBERIA. Locality?: "Turga Rock"; *Bohnhof 247* (NY).
CHINA. Chihli: *J. C. Liu 1299* (UC). Anhwei: *Merrill 11254* (BS); *A. N. Steward 424* (UC, MBG, BS). Chekiang: *Barchet* (US). Kwangtung: *Hwang 193* (UC).
FORMOSA. *Henry 1168* (MBG—2 sheets, NY); *Matsuda 696* (UC).
PHILIPPINES. Mindanao: *Hallier* (BS).
EAST INDIAN ISLANDS. Borneo: *M. S. Clemens 10293* (BS).

50. **Polygonum japonicum** Meisn. in DC. Prodr. xiv. 112 (1856); F. & H. 341; N. 10; Mat. 58; S. 179.

"*P. barbatum* L." Thunb. Fl. Jap. 165 (1784)—acc. to M. l. c. and Franch. & Savat. Enum. Pl. Jap. i. 396.

P. Myosurus Franch. in Nov. Arch. Mus. Paris II. x. 73 [Pl. David. ii. 111] (1888)—acc. to S. l. c.

P. Martini Lévl. et Van. in B. G. B. xi. 340 (1902)—acc. to S. l. c.

Persicaria japonica (Meisn.) Gross acc. to Nakai, Fl. Quelpaert Is. 41 (1914).

P. pseudo-japonicam Ohki in B. M. T. xxxix. 263 (1925).

Persicaria pseudo-japonica (Ohki) Sasaki. List. Pl. Form. 170 (1928).

An erect herb: stems glabrous, usually simple and swollen at the nodes: leaves subsessile; blades lanceolate, usually acuminate, 6–12 cm. long, minutely gland-dotted, pubescent or glabrous (except the margins and midribs, which are appressed setulose): ocreae tubular, appressed setulose, striate, ciliate; tubes 1.–2.5 cm. long; inflorescence in rather slender spikes, terminal or in the axils of reduced upper leaves; spikes 5–10 cm. long: ocreolae curved at the top and ciliolate: flowers exserted, smaller sterile ones often found on the same spikes with those which are fertile and larger: perianth eglandular, 2–5 mm. long, white or pink, including the triangular or convex achene.

Subtropical eastern Asia.

CHINA. Szechuan: *Faber 840* (NY). Hupeh: *Henry 2784* (US), *3057* (GH). Kiangsu: *Allison 47* (GH, US); *R. C. Ching 3452* and *3936* (UC); *Faber* (US); *K. Ling 2252* (UC), *2511* (GH); *Herb. U. Nanking 223* (UC, MBG, BS). Chekiang: *H. H. Hu 1457* (BS). Fukien: *Fukien Chr. U. 5318, 5481, 11349, 11826, 12098* and *12358* (UC); *Metcalf & Chang 502* (UC). Kwangtung: *Hance & Samson 9392* (GH).

JAPAN. Hokkaido: *Maximowicz* (GH, US, T). Hondo: *Iishiba* (UC—2 sheets); *Naumann* (BS); *Watanabe* (GH). Kiusiu: *Oldham 688* (GH, NY); *Tanaka 100378* (UC), *100429* (US). Without Locality: *Herb. Lugd.-Bat.* (GH, MBG, NY, BS), *13b* and *183* (C), *188* (M).

FORMOSA. *Sasaki 704* (UC).

P. pseudo-japonicum is said to differ from *P. japonicum* var. *densiflorum* "in having inserted styles and in the lack of glandular dots on the calyx."

51. **Polygonum longiflorum** Courchet in Lecomte, Fl. Ind. Chin. v. 31 (1910); Mer. in Philipp. Journ. Sci. xii. C. 105.

Stem of plant woody at the base, rather stout; branches glabrous, erect, angular-grooved above: leaves subsessile; blades lanceolate, 3–10 cm. long: ocreae cylindrical, striate and weakly ciliate: spikes of the inflorescence terminal or arranged a few terminating a branch, 4–8 cm. long, densely flowered: ocreolae crowded, ciliate, usually with 3 or more flowers: flowers long-exserted on rather stout pedicels; perianth about 5 mm. long: achene black at maturity, biconvex, about 2.5 mm. long; the surface finely granulate.

Southeastern Asia.

CHINA. Kwangtung: *Levine* [*CCC 248*] (MBG, US, BS), [*CCC 1895* (GH, UC, MBG, AA, BS).

FARTHER INDIA. Indo-China: *Bon 6206* (BS).

52. **Polygonum jucundum** Meisn. Monogr. Polygon. 71 (1826); F. &. H. 341; S. 179.

"*P. barbatum* L." Houtt. Pflanzensyst. vi. 446 t. 49 f. 2 (1780)—acc. to M. in DC. 103.

A rather slender herb: leaves short-petiolate; blades oblong-lanceolate, 3–8 cm. long: ocreae lax, weakly ciliate: spikes of the inflorescence rather laxly flowered, 2–4 cm. long: ocreolae ciliolate: flowers exserted and borne on very slender pedicels; perianth 2.5–3.5 mm. long, eglandular: achene triangular, black and shining, about 2 mm. long.

Eastern and central China.

CHINA. Hupeh: *C. F. Li 11208* (NY). Kiangsu: *R. C. Ching 3491?* and *3944* (UC); *Deschamps* (US); *H. T. Feng 30* (GH); *H. Q. Fu 217* (BS); *Herb. U. Nanking 230* (UC, US), *1345* (BS). Chekiang: *H. H. Hu 1445* (BS). Kwangtung: *McClure 1765* (UC); *Y. Tsiang 1190* (UC). Without Locality: *Faber* (NY, in part); *Staunton* (M).

Forbes & Hemsley, l. c. have interpreted this species on the basis of Hance No. 6057 which differs greatly from the fragment of Meisner's type specimen cited above.

53. **Polygonum borneense** Meisn. in Miq. Ann. Mus. Lugd.-Bat. ii. 58 (1765–66); Mer. in Journ. Straits Br. Roy. As. Soc. 1921 p. 244; Dan. 196.

A local species, in habit resembling *P. barbatum*, but differentiated by having ocreae bearing at the top a row of fine cilia 5–8 mm. long in place of the coarse cilia 1–2 cm. long found in *P. barbatum*. The flowers are early deciduous and the material available is insufficient for the drawing of a proper description. No fruits have been seen.

Endemic to Borneo.

EAST INDIAN ISLANDS. BORNEO: *Korthals 119* (NY); *Herb. Lugd.-Bat. 43* (M).

The specimens cited above appear to have been labelled by Meisner. No other numbers are cited by Danser, l. c.

54. **Polygonum Persicaria** L. Sp. Pl. 361 (1753); F. & H. 345; G. 396; N. 8; C. 32; Mat. 60; Dan. 183.

Persicaria vulgaris Webb. & Moq. in Webb. & Berth. Phyt. Canar. iii. 219 (1836–50). *P. Persicaria* is given as a syn.

Persicaria Persicaria (L.) Small, Fl. S. E. U. S. 378 (1903).

P. dolichopodum Ohki in B. M. T. xxxix. 260 (1925).

Persicaria dolichopodum (Ohki) Sasaki, List Pl. Form. 168 (1928).

A usually glabrous or sometimes puberulent branching herb: leaves subsessile; blades lanceolate, often with a dark spot in the center, up to 10 cm. long: ocreae cylindrical, often short-ciliate: spikes ovoid or cylindric, densely flowered: ocreolae generally ciliolate: flowers slightly exserted: perianth usually pink or reddish, 2–4 mm. long: achenes 1.5–3 mm. broad, lenticular or triangular; surfaces smooth and shining.

Eurasia, but widely introduced in temperate and tropical regions.

BRITISH INDIA. PUNJAB: *T. Thomson* (GH). HAZÁRA: *Duthie* (UC).
AFGHANISTAN. *Aitchison 866* (GH).
CHINA. TIBET: *Schlagintweit 841* (M); *T. Thomson* (GH). FUKIEN: *H. H. Chung 2662* (UC); *Fukien Chr. U. 2984, 3443, 3389, 3681, 3833*—2 sheets, *4407, 4497, 4612, 11285, 11378, 13017, 13317, 13444, 13508, 13633* and *13731* (UC); *Metcalf 449* (UC); *Metcalf & Chang 697?, 764* and *767* (UC).
JAPAN. KIUSIU: *Oldham* (GH); *Tanaka 100063* (UC).
FORMOSA. *Nakahara* (US).
FARTHER INDIA. INDO-CHINA: *Petelot 1749* (UC).

P. dolichopodum is said to differ from *P. Persicaria* in "having oblong or elliptical leaves and much longer petioles."

55. **Polygonum Poiretii** Meisn. Monogr 79 (1826); in DC. 113.

A coarse plant with the habit and inflorescence of *P. japonicum*, but with very weakly ciliated ocreae and with the ocreolae glabrous or nearly so: pedicels exceeding but little the ocreolae: leaves rather broadly lanceolate.

Insular southeastern Asia.

JAPAN. Liu Kiu Islands: *Kawagoe* (BS); *Wright 240* (GH, US).

56. **Polygonum Hydropiper** L. Sp. Pl. 361 (1753); F. & H. 340; G. 401; N. 7; Koid. in Journ. Col. Sci. Tokyo xxvii. Art. 13 p. 51; C. 35; Mat. 57; Mer. 122; Dan. 187; S. 179.

"*P. mite* Pers." Wall. n. 1721 (1828), nom. nud.—acc. to H. 39, where attributed to Wall.

Persicaria Hydropiper (L.) Spach. Hist. Veg. x. 536 (1841).

P. Kinashii Lévl. et Van. ex Lévl. in Bul. Soc. Bot. Fr. li. 422 (1904).

P. Schinzii Schuster in Bul. Herb. Boiss. II. viii. 711 (1908).

P. punctatum Lévl. in Fed. Rep. xi. 67 (1912), not of Elliot or Rafin.

P. koreense Nakai in B. M. T. xxxiii. 6 (1919).

Persicaria koreensis Nakai, l. c. (1919).

P. Hydropiper L. ssp. *megalocarpum* Danser, 188 (1927).

Persicaria koreana Nakai in Mori, Enum. Pl. Cor. 132 (1922), nom. nud.—acc. to Japanese name.

An erect or ascending branched mostly glabrous herb: leaves short-petiolate or subsessile; blades lanceolate: ocrea tubular, 1–2 cm. long, glabrous or short-ciliate: inflorescence axillary or terminal; spikes slender and flexible; ocreolae usually ciliolate, widely separated or approximate, not imbricated: flowers exserted on slender pedicels, or some of them included in the swollen ocreae; perianth greenish, glandular-dotted, 3–4 mm. long: achene lenticular or triangular, opaque; surfaces finely granulate.

Widely distributed in temperate and subtropical regions.

BRITISH INDIA. Ceylon: *Alston 1918* (UC). Bengal: *T. Thomson* (GH); *Wallich 1721-1* (US, M). Assam: *Chatterjee* (US). Kumaon: *Strachey & Winterbottom 16* (GH). Kashmir: *Lace 1834* (US); *Schlagintweit 4461* (M). Northwestern Himalayas: *T. Thomson* (GH).

AFGHANISTAN. *Aitchison 433* (GH); *Griffith 4109-1* (GH).

SIBERIA. Yeniseisk: *Schipchinsky 460* (UC). Irkutsk: *Krystofovic* (UC). Amur: *Karo 542* (GH).

CHINA. Manchuria: *Bohnhof 203* (NY—2 sheets). Yunnan: *E. E. Maire 151* (UC), *357* (GH, UC). Hupeh: *Henry 5068* (GH). Anhwei: *K. K. Tsoong 4331* (BS). Kiangsu: *Faber* (MBG); *Henry* (NY). Chekiang: *Barchet* (US); *C. Y. Chiao 1431* (UC). Fukien: *H. H. Chung 2534* (UC); *Fukien Chr. U. 3957, 4425, 4775, 4877, 5678* and *6191* (UC); *Metcalf & Chang 202, 217* and *501* (UC); *Norton 1501* (US, BS), *1502* (US—in part). Kwangtung: *Dunn 6362* (BS); *Faber 1765* (BS); *Groff 146* and *593* (UC); *Levine* [*CCC 1039*] (MBG, US, BS); *Merrill 10136* (BS); *Tsang 130* (UC).

JAPAN. Hokkaido: *Brooks 385* (UC). Hondo: *Iishiba* (UC); *United States Nat. Herb. 1396963; Watanabe* (GH). Kiusiu: *Boehmer 215* (NY). Without Locality: *Herb. O. Ames; United States Nat. Herb. 1396943.*

FORMOSA. *Faurie 1187* (BS); *Sasaki 699* (UC).

FARTHER INDIA. Siam: *Annandale 1815* (BS).

PHILIPPINES. Luzon: *Merrill 744* (BS), *4428* (US, NY, BS); *C. B. Robinson* [*PBS 14127*] (US, BS); *R. S. Williams 998* (NY—2 sheets, BS); *Vanoverbergh 80* (MBG).

EAST INDIAN ISLANDS. Java: *Koorders 27898-B* (UC). Without Locality: *Jacquemont 884* (BS).

P. Kinashii appears to be founded especially upon the character of dimorphic achenes occurring in the same spike. This is typical of *P. Hydropiper* in various parts of the world. *P. Schinzii* is said to be distinguished by the smallness of the oil glands in the leaves. *P. punctatum* is said by Léveillé to be related to *P. minus* Huds., but distinguished by inflated glabrous sheaths and conspicuously punctate achenes. *P. koreense* is near *P. Kawagoeanum* and *P. paludicolum* of Makino, but with perianth glandular-punctate. No specimens have been seen representing these species.

56a. **Polygonum Hydropiper** L. var. **flaccidum** (Meisn.) comb. nov.

P. oryzetum Blume, Bijdr. ii. 531 (1825)—acc. to Dan. 187, 189 = *P. Hydropiper* L. ssp. *microcarpum* var. *triquetrum.*

"*P. barbatum* Willd." Roxb. Fl. Ind. ii. 289 (1832)—acc. to H. 39 = *P. flaccidum.*

P. flaccidum Meisn. in DC. 107 (1856).

P. gracile R. Br. ex Meisn. op. cit. 109 (1856)—acc. to Dan. l. c. = var. *lenticularis.*

P. oryzetorum Meisn. op. cit. 106 (1856)—acc. to Dan. l. c. = var. *triquetrum.*

P. rivulare Helfer ex Meisn. op. cit. 107 (1856) = *P. flaccidum.*

"*P. Posumbu* Hamilt. ex D. Don" Thwaites, Enum. Pl. Zeyl. 245 (1858)—acc. to H. l. c. = *P. flaccidum.*

P. Hydropiper L. var. *acuminata* Franch. & Savat. Enum. Pl. Jap. ii. 474 (1879).

P. asperulum Wall. ex Hook. f. l. c. (1886) = *P. flaccidum.*

P. Bisculatium Hamilt. ex Hook. f. l. c. (1886) = *P. flaccidum.*

P. ciliatum Roxb. ex Hook. f. l. c. (1886) = *P. flaccidum.*

Persicaria flaccida (Meisn.) H. Gross ex Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 112 (1919).

P. Hydropiper L. ssp. *microcarpum* Danser, 189 (1927), in part.

Distinguished from *P. Hydropiper* as a coarser plant, scabrid on nerves, margins of leaf blades and ocreae: leaf blades lanceolate, acute or acuminate; ocreae with moderately long cilia, usually less swollen than in the typical form and without included achenes: inflorescence

more lax and slender: perianth reddish, 2.–3.5 mm. long at maturity: achenes usually triangular.

Tropical and subtropical regions of the old world.

BRITISH INDIA. CEYLON: *Alston 612* (UC). BENGAL: *Kuntze 6513* (NY); *Lindley* (T); *T. Thomson* (GH); *Wallich 1721-3* (M). ASSAM: *Clarke 44681-B* (US); *Jenkins* (T); *Prain* (US); *Wallich* (US). WITHOUT LOCALITY: *Wight 2453* (GH).

CHINA. YUNNAN: *Henry 12526* (NY—2 sheets). HUPEH: *Henry 67* (GH), *2360* (GH—2 sheets). CHEKIANG: *H. H. Hu 35* (UC). KWANGTUNG: *To 1827* (UC). HAINAN: *McClure 1307* (BS). WITHOUT LOCALITY: *Faber* (NY—in part).

JAPAN. HONDO: *Herb. Bur. Sci. Manila; Matsumura* (US); *United States Nat. Herb. 1396942; Watanabe* (OA, US). KIUSIU: *Oldham 689* (GH). WITHOUT LOCALITY: *Herb. Lugd.-Bat.* (GH, MBG, M), *3* (C), *22* (NY), *25* and *186* (US), *190* (M).

FORMOSA. *Henry 88* (NY); *Nakahara 347* (BS).

FARTHER INDIA. INDO-CHINA: *Squires 101* (GH, NY); *Thorel* (BS—2 sheets). BURMA: *Helfer 4108* (GH). MALAY PENINSULA: *Holttum 9752* (UC).

PHILIPPINES. LUZON: *Merrill 1712* (GH, MBG, BS).

EAST INDIAN ISLANDS. BORNEO: *Korthals 120* and *122* (US); *Herb. Lugd.-Bat. 98* (C). LINGGA: *Bunnemeyer 6819* (UC). SUMATRA: *Bunnemeyer 2994* (BS); *Korthals 143* (NY), *146* (US), *157* (C), *158* (M). JAVA: *Backer 6178* (UC); *Brink 1394* (UC, BS), *2973* (BS); *Horsefield* (GH); *Kuntze 4323* (NY); *Herb. Lugd.-Bat.* (T), *70*, *71* and *74* (US), *78* (M), *87* (NY).

The characters of size and scabridity of the plants, ciliation of the ocreae, flowers and fruits not included in the ocreae and of triangular achenes were found to vary so as to make the sharp limitation of *P. flaccidum* impossible. Hence, it is here treated as a variety. Hooker f. l. c., identifies Roxburgh's *P. flaccidum* as *P. serrulatum* and retains Meisner as authority for the name in its present use. The var. *acuminata* of Franch. & Savat. cannot be used here because they also retained *P. flaccidum* Meisn. Danser's ssp. *microcarpum* includes also the material from tropical Asia which has been here treated as typical *P. Hydropiper*.

56b. **Polygonum Hydropiper** L. var. **hispidum** (Hook. f.) comb. nov.

P. Rottleri Roth, Nov. Pl. Sp. 205 (1821)—acc. to H. 39 = *P. flaccidum*?

P. hispidum Hamilt. ex D. Don, p. 71 (1825)—acc. to H. 40 = *P. flaccidum* Meisn. var. *hispida*.

P. Donii Meisn. 72 (1826).

P. Hamiltonii Spreng. Syst. iv. Cur. Post. 155 (1827). *P. hispidum* is given as a syn.

P. Babingtonii Endl. Gen. Suppl. IV. ii. 47 (1847), based on *P. hispidum*.

P. flaccidum Meisn. var. *hispida* Hook. f. 40 (1886).

Persicaria Donii (Meisn.) Nakai in Sasaki, List. Pl. Form. 169 (1928).

Differs from var. *flaccidum* in having generally smaller more ovate leaf blades and in having the branches, ocreae and leaf blades (at least beneath) appressed-hispid.

Continental southeastern Asia, Japan, Formosa and Hainan.

BRITISH INDIA. MADRAS: *G. Thomson* (GH). SIKKIM: *Hooker* (GH). NEPAL: *Wallich* (C), *1723* and *1723-1* (US), *1723-B* and *1723-C* (M). KUMAON: *Strachey & Winterbottom 17* (GH).

CHINA. YUNNAN: *Henry 9245* (US). CHEKIANG: *K. K. Tsoong 1047* (BS). FUKIEN: *H. H. Chung 264* (BS); *Fukien Chr. U. 2769, 5145, 5432* and *5557* (UC); *Hance 761* (GH). KWANGTUNG: *Groff 92* (BS); *Levine* [*CCC 1648*] (GH, MBG, US, BS), [*CCC 3362*] (MBG, US, BS); *McClure 1746* (UC). HONGKONG: *Ford* (MBG). HAINAN: *Moninger 92* (BS); *Tsang 408* and *540* (UC).

JAPAN. KIUSIU: *Tanaka 100289* (UC—2 sheets, US). WITHOUT LOCALITY: *Herb. Lugd.-Bat.* (NY).

FORMOSA. *Faurie 767*—in part (BS); *Nakahara* (US—2 sheets), *382* and *429* (BS); *Sasaki 21547* (UC).

FARTHER INDIA. INDO-CHINA: *Petelot 733* (BS), *1509* (UC). MALAY PENINSULA: *Burkill 2792* (BS); *Ridley 14518* (BS).

P. Donii is definitely described in Meisner's Monograph with perianth glandular-punctate and with lanceolate appressed-hirsute leaves. It is not clear why Hooker (op. cit. 38) has placed it as a variety under *P. serrulatum*. Var. *hispidum* may be little more than a form of var. *flaccidum*, but it seems to differ in geographical range, particularly in its apparent absence from the region of the Philippines and the East Indian Islands.

56c. **Polygonum Hydropiper** L. var. **Maximowiczii** (Regel) Mak. in Bot. Mag. Tokyo xix. 112 (1905); Mat. 58.

P. Maximowiczii Regel, Gartenflora xiv. 99 t. 468 (1865).

P. graminicum Meisn. in Miq. 59 (1865–66)—acc. to Mat. 58.

P. Hydropiper var. *fastigiatum* Mak. op. cit. xvii. 148 (1903).

P. fastigiatoramosum Mak. op. cit. xxiv. 30 (1910) = l. c.

Distinguished from typical *P. Hydropiper* by being erect and fastigiately branched: leaves slenderly petiolate; blades linear-lanceolate.

Japan.

JAPAN. HONDO: *Maximowicz* (GH, T). WITHOUT LOCALITY: *Iishiba* (US—2 sheets); *Herb. Lugd.-Bat. 218* (M); *United States Nat. Herb. 1396951*.

P. graminicum is distinguished from *P. Hydropiper* by "foliis angustissimis longe petiolatis." Variety *fastigiatum* is said to differ from the type "by the fastigiately much ramose and densely leaved habit" and in having smaller leaves, flowers and achenes.

This variety is cultivated in Japan for the acrid leaves.

56d. **Polygonum Hydropiper** L. var. **laetivirens** Mak. in Bot. Mag. Tokyo xvii. 147–8 (1903); Mat. 58.

P. fluccidum Roxb. var. *lactivirens* Mak. op. cit. vi. 49 (1892). nom. nud.

P. Hydropiper L. var. *lactivirens* Mak. op. cit. x. 64 (1896)—remarks in Japanese.

Differs from typical *P. Hydropiper* by being a more robust plant: leaves shortly petiolate; blades ovate- or oblong-lanceolate, up to 12 cm. long and 5 cm. broad.

Japan.

JAPAN. SHIKOKU: *Watanabe* (GH). KIUSIU: *Tanaka 200280* (UC). WITHOUT LOCALITY: *United States Nat. Herb. 1396941* and *1396964*.

According to Makino, "This is cultivated for the acrid leaves which are used as a condiment, and is never found in the wild state."

57. **Polygonum pubescens** Blume, Bijdr. ii. 532 (1825); M. 97; M. in DC. 105; M. in Miq. 58; Dan. 193.

P. leptostachyum de Br. in Miq. Pl. Jungh. 307 (1854)—acc. to Dan. l. c.

An herbaceous perennial with erect leafy branches bearing a single terminal spike: stems swollen at the nodes, often bursting the lower ocreae: leaves petiolate; blades lanceolate, roughly pubescent beneath and more sparsely so above, 8–15 cm. long below and reduced in size upward: ocreae pubescent and rather coarsely ciliate, 1.5–2. cm. long: ocreolae about 2 per cm. of the spike, glabrous, funnel-form, sometimes ciliolate at the top: flowers on jointed pedicels, easily deciduous: perianth glandular-punctate: achenes triangular, dull and striate, 2–3 mm. long.

The East Indian Islands.

EAST INDIAN ISLANDS. SUMATRA: *Korthals 134* (M). JAVA: *Backer 5672* (UC); *Blume 114* (M).

58. **Polygonum odoratum** Lour. Fl. Cochinchin. 243 (1790); M. in DC. 106; C. 29.

A rather uncommon form near *P. Hydropiper* but differing in having achenes which are smooth and shining.

Southeastern Asia.

In Indo-China the plant is used as a condiment.

FARTHER INDIA. INDO-CHINA: *Pierre 1045* (BS).

59. **Polygonum punctatum** Elliot, Bot. S. C. & Ga. i. 155 (1817); Small in Mem. Colum. Col. i. 88.

P. acre H. B. K. Nov. Gen. ii. 179 (1817), not of Lamarck.

Erect much branched glabrous plant with usually rather narrowly lanceolate leaves 2–8 cm. long: ocreae tubular, glabrous (sometimes

weakly ciliate): spikes slender and flaccid, 4–8 cm. long: ocreolae glabrous (sometimes weakly ciliolate): flowers exserted on slender pedicels which exceed the ocreolae by 1–2 mm.: perianth glandular-punctate, 2–3 mm. long, including the smooth triangular achene.

Widely distributed in temperate and subtropical America, and also found in British India.

BRITISH INDIA. MADRAS: *Wallich* (US). BENGAL: *Clarke 3642* (US). ASSAM: *Clarke 34857-C* (C). WITHOUT LOCALITY: *Wallich 1721-H* (M).

59a. **Polygonum punctatum** Elliot var. **breviciliatum** (Meisn.) comb. nov.

P. acre H. B. K. var *breviciliatum* Meisn. in W. 57 (1832).

This variety differs from the typical form of the species in having narrowly lanceolate leaves (reduced in size upward) and usually more slender branches: flowers in rather lax spikes.

BRITISH INDIA. BENGAL: *T. Thomson* (GH, M—in part). PUNJAB: *Drummond 26793* (UC). WITHOUT LOCALITY: *Wallich 1721-F* (M).

60. **Polygonum minus** Huds. Fl. Angl. ed. 1. 148 (1762); F. & H. 342; G. 396; N. 12; Mat. 59; Mer. 123; Dan. 174; S. 178.

P. strictum All. Fl. Pedem. ii. 207 t. 68 f. 2 (1785)—acc. to H. 36.

P. decipiens R. Br. Prodr. Fl. Nov. Holl. 420 (1810)—acc. to Dan. 178 = ssp. *decipiens*.

P. subsessile R. Br. op. cit. 419 (1810)—acc. to Dan. 176 = ssp. *subsessile*.

P. tenellum Blume, Bijdr. ii. 530 (1825)—acc. to Dan. 176 = ssp. *depressum*.

"*P. Posumbu* Hamilt." Wall. n. 1722 (1828), not of Hamilt.—acc. to H. 36, where ascribed to Wall.

P. hyptostictum Miq. ex Meisn. in DC. 111 (1856), in syn.

P. micranthum Meisn. in Miq. 59 (1865–66)—acc. to Dan. 176 = ssp. *micranthum*.

P. banca Hamilt. ex Hook. f. 36 (1886), in syn.

P. erecto-minus Mak. in B. M. T. xxviii. 110 (1914).

P. Nikaii Mak. op. cit. 114 (1914), in syn. = *P. paludicolum* Mak. var. *Nikaii* Mak.

P. paludicolum Mak. op. cit. 113 (1914).

A profusely branching herb with slender leafy stems: leaves short-petiolate; blades lanceolate to linear: ocreae tubular, pubescent and ciliate, 5–10 mm. long: spikes of the inflorescence terminal or in axils of the upper leaves, rather densely or laxly flowered, 1–3 cm. long: ocreolae ciliolate: flowers small: achenes brown or black and shining,

biconvex or sometimes triangular, 1–2 mm. long and equal to the perianth at maturity.

Temperate and tropical Eurasia.

BRITISH INDIA. Ceylon: *Walker* (BS). Madras: *Hohenacker 1330* (M); *G. Thomson* (GH). Bengal: *Griffith 4106* (GH, T); *Herb. Hamilton* (M); *Hooker & Thomson* (GH). Nepal: *Wallich* (M, NY). Kumaon: *Dudgeon* (MBG)?. Kashmir: *Schlagintweit 4613* (US). Himalayas: *Dudgeon & Kenoyer?* and *123* (MBG).

SIBERIA. Amur: *Karo 227* (BS); *Korshinsky* (US). Locality? ("Turga Roche"); *Bohnhof 215* (NY).

CHINA. Tibet: *T. Thomson* (GH). Mongolia: *Karo 481* (MBG). Manchuria: *Komarov 543* (GH); *Maack 493* (GH). Yunnan: *E. E. Maire 156* (BS). Chihli: *M. S. Clemens 8059a* (BS). Chekiang: *R. C. Ching 4696* (UC, US). Kiangsi: *K. K. Tsoong 4324* (BS). Fukien: *H. H. Chung 230* (BS); *Fukien Chr. U. 4643* (UC); *Metcalf 431* (UC). Kwangtung: *W. Y. Chun 6452* (UC); *Hance 6057* (GH). Hongkong: *Kuntze 3442* and *3522* (NY). Without Locality: *Staunton* (M).

JAPAN. Hondo: *United States Nat. Herb. 1396966.* Kiusiu: *Maximowicz* (GH, US, T). Liu Kiu: *U. Tokyo* (BS). Without Locality: *Faurie 726* and *727* (BS).

FORMOSA. *Faurie 750* (BS); *Henry 1771* (MBG, US).

FARTHER INDIA. Indo-China: *Petelot 315* (BS); *Thorel* (BS).

PHILIPPINES. Luzon: *Elmer* (US, BS—2 sheets); *Merrill 745* and *7809* (US, BS), *9679* (GH, MBG, US); *Ramos* [*PBS 6000*] (US, BS); *Ramos & Edano* [*PBS 45048*] (UC, BS); *C. B. Robinson* [*PBS 14121*] (BS); *Vanoverbergh 80* and *2206* (BS).

EAST INDIAN ISLANDS. Sumatra: *Korthals 159* (M). Java: *Blume 116* (M); *Danser 6748* (UC); *Herb. Lugd.-Bat. 30* (NY).

Locality ("Setul")?; *Herb. Bur. Sci.*

P. erecto-minus is distinguished from *P. minus* forma *trigonocarpa* by being a "smaller plant having the erect stem, leaves punctulate with spots of one kind, the smaller and deeper-coloured flower." From the description *P. paludicolum* can scarcely be separated from *P. minus*.

60a. **Polygonum minus** Huds. var. **procerum** (Danser) comb. nov.

"*P. salicifolium* Delile" Meisn. 77 (1826)—acc. to Dan. 176.

P. Kawagoeanum Mak. in B. M. T. xxviii. 115 (1914)—acc. to Dan. l. c.

P. minus Huds. ssp. *procerum* Danser, p. 176 (1927).

A variety with the coarse habit of some forms of *P. barbatum*, but with the inflorescence and fruit of *P. minus*.

The Philippines and the East Indian Islands.

PHILIPPINES. Mindanao: *Fenix* [*PBS 26078*] (GH, MBG, US, BS); *Ramos & Edano* [*PBS 36712*] (BS); *R. S. Williams 2106* (US, NY, BS). Basilan: *Reillo* [*PBS 16322*] (MBG, BS).

EAST INDIAN ISLANDS. Celebes: *Bunnemeyer 10596* (UC). Moluccas (Amboina): *C. B. Robinson 1667* (GH, MBG, US, BS).

61. **Polygonum minutulum** Makino in Bot. Mag. Tokyo xxviii. 112 (1914).

P. minus Huds. as shown in Somoku-Susetsu vii. t. 65 (1910)—acc. to Mak. l. c.

P. minus var. *interruptum* Maxim. ex Mak. l. c., in syn.

A slender annual, diffusely branching and with openly paniciform inflorescence: ocreae ciliate: leaf blades lanceolate to linear: ocreolae ciliolate: spikes much interrupted: flowers minute; perianth not punctate: achenes smooth and shining, triangular or lenticular, about 1.5 mm. long.

Japan and China.

CHINA. Chekiang: *Faber* (MBG); *Henry M-15* (NY).
JAPAN. Hondo: *Watanabe* (OA, US). Shikoku: *Watanabe* (GH).

62. **Polygonum** (§ **Persicaria**) **excurrens** sp. nov. [Plate III.]

Herba erecta 5–10 dm. alta; axe excurrente; ramis pubescentibus vel glabrescentibus; foliis sessilibus membranaceis lanceolatis integerrimis hispido-scabriusculis 4–10 cm. longis; ocreis tubulosis scabriusculis ciliatis; spicis tenuibus elongatis, fasciculis 2–4-floribus; ocreolis ciliolatis; floribus exsertis; pedicellis longitudine ocreolis aequantibus vel paullo superantibus; perianthio 1–2 mm. longo; achaenio triangulare laevi in perianthio incluso.

An erect herb 5–10 dm. high: axis excurrent; branches pubescent to nearly glabrous, numerous to very few: leaves sessile, membranous, lanceolate, entire, hispid to scabridulous, 4–10 cm. long: ocreae tubular, 8–15 mm. long, with cilia .5–.7 the length of the tube: spike slender and elongate, with usually a single ocreola about 1.5 cm. below the flowering portion of the rhachis; fascicles 2–4-flowered and dispersed 3–6 per cm. of the rhachis; ocreolae ciliate: flowers exserted; pedicels equal to or somewhat exceeding the length of the ocreolae: perianth 2 mm. long, 5-cleft to below the middle; lobes usually 5-veined: achene triangular, smooth and shining, included in the perianth.

Eastern China, Korea and Japan.

SIBERIA. Amur: *Topping 2398* and *2433* (US).
CHINA. Chihli: *M. S. Clemens 8059* (BS); *Read 717* (UC). Hupeh: *Henry 4790* (GH), type! Anhwei: *R. C. Ching 4421* (UC, US). Chekiang: *R. C. Ching 1940* (UC); *Y. L. Keng 1033* (UC). Kiangsi: *Bailey* (GH).
KOREA. *Faurie 555* and *565* (BS).
JAPAN. Hokkaido: *Herb. Sapporo Agr. Col.* (GH). Shikoku: *Watanabe* (GH, OA).

This species brings together forms varying considerably in quality and denseness of pubescence as well as in slenderness of stem and inflorescence. The plant is distinctly separate from *P. caespitosum* and its varieties because of the definite central axis.

63. **Polygonum limicola** Sam. in Hand.-Maz. Symb. Sin. vii. 178 (1929).

A species close to *P. caespitosum* but characterized by having the inflorescence of rather densely flowered spikes with overlapping ocreolae which are rose-colored at the top.

CHINA. HUPEH: *Nelson* (UC)!

64. **Polygonum caespitosum** Blume, Bijdr. 532 (1825); Dan. 151 f. 3; S. 178.

P. Posumbu Hamilt. ex D. Don, Prodr. Fl. Nep. 71 (1825)—acc. to Dan. l. c.

"*P. Donii* Meisn." Wall. Cat. n. 1723-B (1828)—acc. to H. 38 = *P. Posumbu.*

P. rhizocaulon De Bruyn in Miq. Pl. Jungh. 306 (1854)—acc. to Dan. l. c.

P. gracile Hamilt. ex Hook. f. l. c. (1886), in syn. = *P. Posumbu.*

P. Yokusaianum Mak. in B. M. T. xxviii. 116 (1914)—acc. to Dan. l. c.

P. giranense Ohki in B. M. T. xxxix. 260 (1925).

P. Kawakamii Ohki, op. cit. 261 (1925).

Persicaria giranensis (Ohki) Sasaki, List Pl. Form. 169 (1928).

Persicaria Kawakamii (Ohki) Sasaki, l. c. (1928).

A perennial herb with branching repent stems without a central axis: ocreae ciliate: leaves sessile or nearly so; blades usually ovate, but sometimes lanceolate, appressed-hairy, at least above and usually with caudate tips: inflorescence of usually solitary terminal spikes: ocreolae ciliate: flowers 3–5 in a fascicle, on long-exserted pedicels: perianth white to rose-colored, 2–2.5 mm. long: achene triangular, included; surfaces smooth and shining.

Tropical and subtropical eastern Asia.

BRITISH INDIA. ANDAMANS: *Helfer 4133* (GH). BENGAL: *Clarke 35347-B* (C). ASSAM: *Craib 181* (BS); *Hooker & Thomson* (GH—2 sheets, BS). SIKKIM: *Craib 21* (BS); *Gage* (BS); *Kuntze 6998* (NY). EASTERN HIMALAYAS: *Cave* (BS). NEPAL: *Wallich* (M). CHAMBA: *Schlagintweit 3564* (UC).

CHINA. MANCHURIA: *Komarov 541* (GH, BS). YUNNAN: *Henry 9245-B* (NY—2 sheets), *12217* (US, NY—2 sheets). SZECHUAN: *Faber 849* and *850* (NY). SHANTUNG: *M. S. Clemens 1368* (BS). HUPEH: *Henry 4797* (GH), *4939* (US). KIANGSU: *U. Nanking 236* (UC). CHEKIANG: *C. Y. Chiao 819, 976* and *1036* (UC); *R. C. Ching 3779* and *3821* (UC); *K. K. Tsoong 4325* (BS). KIANGSI: *Shearer* (GH); *A. N. Steward 721* (UC, MBG, BS), *984* (UC, US). FUKIEN: *Dunn* [*H. H. 5458*] (GH); *Fukien Chr. U. 4312* and *5325* (UC); *Metcalf 499* (UC); *Metcalf & Chang 504* and *543* (UC). KWANGSI: *McClure 1779* (UC). KWANGTUNG: *Kuntze 3523* (NY); *McClure 1783* (UC); *To, Tsang, & Tsang 347* (US), *491* (UC, US); *Wang 576* (UC). HAINAN: *McClure 2667* (BS). HONGKONG: *Harland* (GH).

JAPAN. Hondo: *Maximowicz* (GH); *Watanabe* (OA, US). Without Locality: *Faurie 4228* and *4962* (BS).

FORMOSA. *Nakahara* (US).

FARTHER INDIA. Indo-China: *Petelot 94* (BS), *1611*, *3260* and *3274* (UC).

PHILIPPINES. Luzon: *M. S. Clemens 17416* (UC); *Elmer 5776* (US, NY); *Fenix* [*PBS 12893*] (US, BS); *Mearns* [*PBS 2794* and *4293*] (BS); *Merrill 4805* and *6575* (US, NY, BS), *7681* (US, BS); *Santos* [*PBS 31648*] (BS); *Vanoverberg 1783* (BS); *R. S. Williams 1450* (GH, US, NY, BS). Mindanao: *Elmer 11546* (MBG, US, NY); *Ramos & Edano* [*PBS 39180*] (US, BS).

EAST INDIAN ISLANDS. Sumatra: *Bunnemeyer 2587* (BS); *Korthals 135* (M), *149* (C); *Yates 1416* (UC). Java: *Blume 111* (M); *Kuntze 5967* (NY); *Herb. Lugd.-Bat.* (GH), *46* and *65* (C), *73* and *86* (M), *92*, (US); *Sapün 2476* (UC); *Setchell* (UC); *de Vriese* (M); *Waitz 162* (M), *163* (C); *Warburg 11030* (BS).

Locality?: "Turong": *Kuntze 3880* (NY).

In this and related forms the presence of smut-infected flowers may be a confusing factor because of the resulting abnormally large size.

64a. **Polygonum caespitosum** Blume var. **Mearnsii** (Elmer) comb. nov.

P. Mearnsii Elmer, Leafl. Philipp. Bot. i. 289 (1908).

This plant differs fron the typical form of the species by having linear-lanceolate leaves.

The Philippines.

PHILIPPINES. Luzon: *M. S. Clemens 5889* (UC); *Elmer 8356* (US, NY, BS); *R. S. Williams 1355* (US, NY—2 sheets, BS).

64b. **Polygonum caespitosum** Blume var. **longisetum** (De Bruyn) comb. nov. Dan. 170 f. 7; S. 178.

P. longisetum De Bruyn in Miq. Pl. Jungh. 307 (1854).

P. Donii Meisn. var. *longisetum* de Br. ex Miq. Fl. Ind. Bat. i. 1000 (1855), not *P. Donii* Meisn., based on *P. longisetum*.

P. Blumei Meisn. in Miq. 57 (1865–66)—acc. to Dan. l. c.

P. Blumei Gandog. in Bul. Soc. Bot. Fr. lxvi. 225 (1919)—acc. to Dan. l. c.

P. buisanense Ohki in B. M. T. xxxix. 259 (1925).

Persicaria buisanensis (Ohki) Sasaki, List. Pl. Form. 168 (1928).

Annual plant with more generally erect stems which do not usually root at the base, but still without a central axis: leaves usually glabrous above but ciliate on the margins and on the veins beneath: pedicels about equal to the ocreolae; perianth rose-colored to wine red. Otherwise the plant is similar to *P. caespitosum* with which it has been often confused.

Subtropical and tropical eastern Asia.

BRITISH INDIA. Garhwal: *Schlagintweit 8759* (GH). Punjab: Drummond *26802* (UC); *R. R. Stewart 363* and *1736* (NY). Kashmir: *Schlagintweit 13167* (US). Himalayas: *Dudgeon & Kenoyer 136* (MBG).

CHINA. Chihli: *Bretschneider* (MBG, US); *J. C. Liu 2010* (UC). Hupeh: *Henry 1472, 1672* and *2372* (GH). Honan: *A. N. Steward 1550* (US, UC); *K. K. Tsoong D-759* (BS). Anhwei: *R. C. Ching 4096* (UC, US). Kiangsu: *Faber* (NY); *Maingay 463* (GH—2 sheets, MBG, T); *Herb. U. Nanking 230* (GH), *236* (GH, US, BS); *Herb. New York Bot. Gard.* Chekiang: *Allison 20* (GH, US); *Barchet 551* (US); *C. Y. Chiao 965, 1119* and *1320* (UC); *R. C. Ching 1701* (UC, US); *K. K. Tsoong 4328* (BS). Kiangsi: *A. N. Steward 665* (BS). Fukien: *Herb. Fukien Chr. U. 767* (US), *1096, 1119, 1989, 2127, 2772, 3693-2* sheets, *3717, 4065-B, 4235*—2 sheets, 4516, *4609, 4728, 4759, 4776, 4928, 5282, 6049, 6392, 12571, 12609* and *13839* (UC); *Metcalf 497* (UC); *Metcalf & Chang 190* and *961* (UC); *Norton 1500* (US); *K. K. Tsoong 325* (BS). Kwangtung: *W. Y. Chun 148* (UC); *Groff 587* (UC); *Hance 761* (GH); *Levine* [*CCC 943*] (GH, MBG, US, NY, BS), [*CCC 1318*] (GH, MBG, BS), [*CCC 6387*] (BS); *Merrill 10065* and *10093* (BS); *To* [*CCC 10607*] (*BS*); *To, Tsang & Tsang 958* (UC, US); *S. W. Williams 18* (GH).

JAPAN. Hokkaido: *Brooks 382* (UC); *Herb. Sapporo Agric. Col.* (GH). Hondo: *Kuntze 3228* (NY); *Savatier 1023* (US); *United States Nat. Herb. 44488, 1396934* and *1396949; Watanabe* (OA, US—2 sheets). Shikoku: *Watanabe* (GH). Kiusiu: *Tanaka 100117* (UC, US). Liu Kiu: *Boehmer 43* and *184* (NY); *Wright 249* (GH, US). Without Locality: *Kuntze 3253* (NY); *Herb. Lugd.-Bat. 23* and *187* (M), *194* (NY), *200* and *204* (M); *Oldham 169* (GH).

FORMOSA. *Faurie 767*—in part, *1505* and *1506* (BS); *Oldham 425* (GH).

PHILIPPINES. Luzon: *Curran* [*PFB 11609*] (BS); *Mearns* [*PBS 2280*] (BS). *Mindanao: M. S. Clemens* (BS).

EAST INDIAN ISLANDS. Sumatra: *Yates 2421* (UC). Java: *Arnott* (T); *Brink 3653* (BS); *Danser 6668* (UC); *Forbes 613* (GH); *Hallier* (UC); *Kuntze 4405* (NY); *v. Leeuwen 8549* (UC); *Herb. Lugd.-Bat. 40* (NY), *51, 53, 68* and *75* (M).

P. buisanense is described with glabrous punctate leaves in which the margins and nerves are ciliate; and the pedicels are included. It is said to differ from *P. Posumbu* "in having linear-lanceolate leaves."

There has been much confusion in naming material here placed as var. *longisetum*, a good deal of it being called *P. serrulatum* Lagasc. which is more like *P. barbatum* in habit. Danser, l. c., and Samuelsson, l. c., agree upon the use of *P. caespitosum* and *P. longisetum* to cover this group and that which precedes. Much yet remains to be done in this part of § *Persicaria*.

Section 4. CEPHALOPHILON Meisn. in Wall. Pl. As. Rar. iii. 59 (1832).

Key to Species.

a. Leaf blades narrowly lanceolate: inflorescence normally a single head terminating each branch; flowers at maturity on slender pedicels, exserted: plants pubescent and finely glandular-hairy ..... 65. *P. criopolitanum.*

a. Leaf blades ovate to oblong (broadly lanceolate in a form of *P. chinense*): inflorescence of several heads variously arranged on short branches; flowers not exserted or only slightly so: plants glandular-hairy, pubescent or glabrous....*b*

b. Perianth accrescent and fleshy in fruit: peduncles glandular: plant shrubby: leaves petiolate; blades ovate to lanceolate 66. *P. chinense.*

b. Perianth not at all fleshy: peduncles glandular or not....*c*
c. Petioles winged and (at least some of them) with a pair of herbaceous appendages at the base....*d*
d. Leaves usually runcinate- or lyrate-pinnatifid, not punctate.....67. *P. runcinatum.*
d. Leaves entire; blades ovate to oblong, usually punctate 68. *P. nepalense.*
c. Petioles not winged and without herbaceous appendages at the base....*e*
e. Leaf blades palmately cleft: plant coarsely pubescent 69. *P. palmatum.*
e. Leaf blades entire: plants glabrous or pubescent....*f*
f. Heads of the inflorescence on leafless peduncles....*g*
g. Peduncles glabrous: ocreae tubular, usually finely ciliate at the top....*h*
h. Petioles winged from the tapering leaf blades 70. *P. microcephalum.*
h. Petioles not winged.....71. *P. Wallichii.*
g. Peduncles minutely scabrid: ocreae fuscous, subhispid.....72. *P. Dielsii.*
g. Peduncles glandular-pubescent....*i.*
i. Leaf blades ovate-cordate, 2–4 cm. broad; leaves long-petiolate, rather coarsely pubescent..73. *P. Strindbergii.*
i. Leaf blades ovate, often tapering into the petioles, not cordate; 5–30 mm. broad: leaves mostly rather short-petiolate and glabrous (except the nerves and margins of the leaf blades)....*j*
j. Surfaces of the achenes smooth or finely granulate....*k*
k. Ocreae glabrous and eciliate....*l*
l. Plant with a few elongated prostrate branches: flowering heads usually solitary, about 1 cm. across; bracts membranous, not herbaceous. 74. *P. sphaerocephalum.*
l. Plant dwarfed, diffusely branching: flowering heads often 2 or 3 from the same node, about 5 mm. across; outer bracts herbaceous with hyaline margins.75. *P. glaciale.*
k. Ocreae hispid and finely ciliate: flowering heads few or rarely solitary.....76. *P. capitatum.*
j. Surfaces of the achenes deeply pitted.....77. *P. humile.*
f. Heads of the inflorescence (or most of them) subtended by leaf-like bracts, often not peduncled....*m*
m. Leaves definitely petiolate: inflorescence not at all pedunculate: plants not glandular....*n*
n. Plant scabrous, without recurved bristle-like hairs at the base of the ocreae: fertile stamens 3 or 4.....78. *P. filicaule*
n. Plant nearly glabrous, with a border of downward-pointing bristle-like hairs at the base of each ocrea....*o*
o. Fertile stamens 2–5: achene included in the perianth at maturity: perianth 4-cleft..79. *P. pilosum.*
o. Fertile stamens 8: tip of the achene exserted at maturity: perianth 4- or sometimes 5-cleft....*p*

p. Leaf blades and perianth not glandular. 80. *P. cyanandrum.*
p. Leaf blades and perianth minutely glandular-punctate.....81. *P. Huberti.*
m. Leaves sessile, or if with short unwinged petioles, then the achene 3–4 times as long as the perianth 82. *P. delicatulum.*

65. **Polygonum criopolitanum** Hance in Ann. Sci. Nat. V. v. 238 (1866); F. & H. 336; Dunn in Kew Bul. Add. Ser. x. 217; S. 180.

A caespitose procumbent herb: plants with a mixture of appressed strigose pubescence and fine glandular hairs: leaves short-petiolate; blades narrowly lanceolate, 1–3 cm. long: inflorescence in clusters terminating the leafy branches: flowers somewhat exserted on slender pedicels; perianth 3–4 mm. long.

Southern and central China.

CHINA. Hupeh: *Henry 3232* (GH). Kiangsu: *K. Ling 2553* (UC). Chekiang: *R. C. Ching 3583* (UC); *H. H. Hu 515* (UC, BS). Kiangsi: *K. K. Tsoong 4313* (BS). Kwangtung: *Dunn* [*HH 6369*] (BS); *Hance 10506* (GH, M); *Levine* [*CCC 3405*] (GH, MBG, BS); *Levine, Buswell & To* [*CCC 367*] (BS); *McClure 1778* (UC); *Tsang & Wong 3220* (UC).

There is in the Meisner Herbarium a specimen of Hance's type number 10506 (noted above) labeled in Meisner's hand as a new species under the date of 26. vi. 67. The name does not appear to have been published, so it may be inferred that Meisner discovered Hance's publication before his description was issued.

66. **Polygonum chinense** L. Sp. Pl. 363 (1753); F. & H. 335; G. 408; C. 37; Mat. 56; Mer. in Journ. Straits Br. Roy. As. Soc. 1921 p. 245 and Enum. 122; Dan. 209; S. 180.

Rumex umbellatus Houttuyn Pfl. Syst. vi. 388 t. 47 f. 3 (1773) = a. *Thunbergiana* Meisn. in DC. 130.
P. zonulatum Noronha in Verh. Batav. Gen. V. Ed. 1. Art. iv. 23 (1790), nom. nud. acc. to M. in DC. 131 = var. *corymbosum.*
P. sinense J. F. Gmel. Syst. ii. 639 (1791)—acc. to Ind. Kew.
P. corymbosum Willd. Sp. Pl. ii. 452 (1799)—acc. to H. 44.
P. brachiatum Poir. in Lam. Encyc. vi. 150 (1804); Illustr. t. 315 f. 4 (1823) = d. *brachiatum* Meisn. in DC. 131.
P. ovatum Heyne in Roth, Nov. Pl. Sp. 206 (1821)—acc. to H. 44.
P. patens D. Don 73 (1825) = d. *brachiatum* Meisn. in DC. l. c.
P. auriculatum Meisn. 59 t. 6 (1826) = c. *ovalifolium* Meisn. in DC. l. c.
P. polycephalum Wall. n. 1707 (1828), nom. nud.—acc. to H. 44.
Coccoloba crispata Ham. ex Roxb. Fl. Ind. ii. 292 (1832)—acc. to H. 45.

P. cymosum Roxb. op. cit. 289—acc. to H. 44.
Ampelygonum chinense (L.) Lindl. in Bot. Reg. xxiv. Misc. 62 (1838).
P. panduraeforme Hamilt. ex Endl. Gen. Suppl. IV. ii. 48 (1847), in syn.
Coccoloba indica Wight ex Meisn. in DC. l. c. (1856), in syn. = c. *ovalifolium*.
P. crispatum (Ham.) Clarke in Journ. Linn. Soc. xv. 138 (1876).
P. adenotrichum Wall. ex Hook. f. l. c. (1886), in syn.
P. paradoxum Lévl. in Fed. Rep. vii. 339 (1909)—acc. to S. l. c.
P. Damrongiana Hosseus in Fed. Rep. x. 62 (1911).
Persicaria chinensis (L.) Nakai in Sasaki, List Pl. Form. 168 (1928).

A glabrous, pubescent or glandular-hairy decumbent shrub: branches angled and grooved: leaves extremely variable, petiolate; petioles usually 2-auricled at the base, auricles often caducous; blades ovate to lanceolate, margins often crispate, bases cordate to truncate or deltoid: ocreae membranous, obliquely cleft, 1–3 cm. long: inflorescence cymose or corymbose, usually dichotomous; peduncles usually glandular-hairy: flowers white or pink; perianth 5-cleft, accrescent and fleshy in fruit: achenes triangular, about 2.5 mm. long; surfaces opaque: fruit (not common) black, berry-like, the fleshy perianth enclosing and somewhat adhering to the achene.

Tropical and subtropical eastern Asia.

BRITISH INDIA. Ceylon: *Kuntze 2001-B* (NY); *G. Thomson* (GH); *Walker 1762* (BS). Madras: *G. Thomson* (GH). United Provinces: *U. Singh 46* (UC). Assam: *Chatterjee* (US); *Hooker & Thomson* (GH—2 sheets, M—3 sheets); *Marten* (BS); *Masters* (GH); *Wallich & Griffith* (M—2 sheets). Sikkim: *Hooker* (GH, M); *T. Thomson* (GH). Nepal: *Wallich* (US), *1705/1* (M—2 sheets), *1706* (US). Kumaon: *Strachey & Winterbottom 36* (GH), *36½* (GH, M). Garhwal: *Ormaston* (US). Northwestern Himalayas: *T. Thomson* (GH). Locality?: *Wallich 1705/5* (M), *1705/6* (C), *1706*, *1707* and *1707-B* (M). Without Locality: *Griffith* (GH—2 sheets); *Wallich* (T), *1705/6* (M); *Wight 2458* (GH).

CHINA. Yunnan: *Henry 9007* (US, AA, NY), 9007-*A* (NY—2 sheets), *10044* (AA), *10044-A* (NY—2 sheets), *11970* and *12132* (AA, NY—2 sheets), *12132-A* (US), 12348 (US, NY) *12695* (AA, NY—2 sheets); *E. E. Maire 159*, *351* and *362* (UC), *364* (GH, UC), *369* (UC), *1551* (BS); *Rock 6205* (GH, UC, US), *7617* (US); *Schneider 2588* (GH), *2688* (AA); *K. K. Tsoong 3021* (BS). Szechuan: *W. P. Fang 3485* (NY). Hupeh: *Henry 155*, *2193* and *7741* (GH). Yangtze Valley: *Faber* (MBG). Fukien: *H. H. Chung 1553* (UC), *2374* (GH, UC), *2877* (GH); *Henry 809* (MBG). Kwangtung: *Gaudichaud* (BS); *Herb. Hongkong 10105* (BS); *Levine* [*CCC 161* and *225*] (MBG), [*CCC 1688*] (GH, MBG, US, BS); *Levine & Groff* [*CCC 99*] (MBG, BS), [*CCC 128* and *161*] (BS); *Merrill 10039* (BS); *To & Fuson* [*CCC 2745*] (BS); *Tsang & Wong 2511* and *3027* (UC); *Y. Tsiang 1378* (UC); *Wang 579* (AA). Hongkong: *Ford* (MBG); *Wright 418* (GH, T). Hainan: *Henry 41* (GH); *McClure 3063* (UC, MBG, BS); *Moninger 91* (BS). Without Locality: *S. W. Williams* (GH).

JAPAN. Kiusiu: *Boehmer 139* (NY); *Maximowicz* (GH, T); *Oldham 693*

(GH). Liu Kiu: *Herb. U. Tokyo* (BS); *Wright 251* (GH). South Japan: *Iisiba* (UC—2 sheets). Without Locality: *Light* (BS); *Herb. Lugd.-Bat.* (GH), *41* (M), *203* (C); *Herb. U. Tokyo* (BS—3 sheets).

FORMOSA. *Faurie 754, 758* and *1502* (BS); *Henry 299, 412* and *628* (MBG), *809* (NY), *1542* (MBG); *Sasaki 697* (UC).

FARTHER INDIA. Indo-China: *Petelot 95* (US, BS), *1517, 1612* and *3277* (UC); *Thorel* (BS). Siam: *Hosseus 345* (MBG); *Rock 101* and *102* (US), *157* and *218* (US, BS), *417, 443, 1070, 1071* and *1598* (US), *1709* (UC, US), *1766* (US), *1900* (UC, US). Burma: *Bruce* (C, M); *Gallatly 175* (BS); *King's Collector 243* (BS); *Kloss* (UC); *S. Mokim 1130* (BS); *Rock 829* (US, BS), *1940* (UC, US), *2238* (AA, US); *Smith 92* (GH). Malay Peninsula: *Henderson 17924* (UC).

PHILIPPINES. Batanes: *Agudo 51* (BS); *Fenix 114* (BS); *Mearns* [*PBS 3223*] (BS). Luzon: *Baeani 31* (BS); *Bona* (US), *127* (BS); *M. S. Clemens* (BS—2 sheets) and *9131* (BS), *17418* (UC); *Cuming 1641* (MBG); *Curran* [*PBS 4879, 11620* and *15619*] (BS); *Curran, Merritt & Zschokke* [*PFB 16053*] (BS), [*PFB 16054*] (US, NY, BS), [*PFB 16056*] (BS); *Elmer 5817* and *5852* (US, NY, BS), *5856* (US, BS), *5901* (US, NY, BS), *6288* (BS); *Fenix* [*PBS 12622*] (BS), [*PBS 28153*] (US, BS); *Foxworthy 717* and *750* (BS), *924* (US, NY, BS); *Klemme* [*PFB 5681*] (MBG) and *104, 139, 143* and *164* (BS); *Loher 4601* and *4602* (US), *5816* (BS), *12348* (UC), *13028* (BS); *McClure 16022* (UC); *McGregor 688* (US, BS), *735, 847, 946, 3467* and *4328* (BS); *Mearns* (BS—3 sheets), [*PBS 2476, 2711* and *2961*] (BS), [*PBS 3414*] (US, BS), [*PBS 4443*] (BS), *51* and *76* (US); *Merrill 746* (US, BS), *4417* (US, NY, BS); *Merritt* [*PFB 15851*] (BS); *la Paz 6093* (BS); *Ramos* [*PBS 1832*] (GH, US, BS), [*PBS 4789*] (BS), [*PBS 5048*] (GH, BS), [*PBS 5338*] (BS), [*PBS 5454*] (US, NY, BS), [*PBS 7274* and *33234*] (BS); *Ramos & Edano* [*PBS 38136* and *40277*] (BS), [*PBS 44894*] (UC), [*PBS 48618*] (UC, BS); *C. B. Robinson* [*PBS 14009*] (BS); *Santos 20* and *218* (BS); *Sevrens 49* (BS); *Topping 109* and *113* (US), *144* (US, BS); *Vanoverbergh 31, 160* and *3721* (BS); *R. S. Williams 965* (US, NY, BS—2 sheets), *1032* (US, NY, BS), *1059* (GH, US, NY—2 sheets, BS), *1268* (NY—2 sheets, BS), *2009* (US, NY—2 sheets, BS). Mindoro: *Merrill 5780* (BS—2 sheets); *Merritt* [*PFB 11034*] and *861* (BS). Mindanao: *M. S. Clemens* (UC, BS), *74* (BS), [*PBS 15606*] (UC); *Mearns & Hutchinson* [*PFB 4761*] (BS); *Ramos* [*PBS 14476*] (BS); *Ramos & Edano* [*PBS 49402*] (UC, BS); *R. S. Williams 2542* (GH, US, NY—2 sheets, BS). Negros: *Elmer 10438* (MBG, US, NY). Panay: *C. B. Robinson* [*PBS 18119*] (BS). Locality?: *Baker 4107* (BS).

EAST INDIES. Sumatra: *Bartlett & La Rue 292* (GH); *Bunnemeyer 2766, 2814, 3011, 3761, 4307* and *4945* (BS); *Korthals* (GH), *127, 138* and *140* (M), *160* (NY); *Robinson & Kloss* (US); *Yates 93* (BS), *1981, 2175* and *2417* (UC). Java: *Blume* (C, NY); *60, 104* and *105* (M), *106* (C); *v. Brink 4741* (BS); *Forbes 972* (GH); *Kembang 297* (BS); *Koorders 23695-B* (UC, AA), *26035-B* (UC—2 sheets), *29352-B* (UC); *Kuntze 5335* (NY); *Herb. Lugd.-Bat.* (GH—2 sheets), *57* (C), *59* (C, M), *70* (C), *72* and *77* (NY), *88* (C), *93, 94* and *96* (NY), *99* and *139* (C); *Palmer & Bryant 278* and *427* (US), *893* (UC, US), *946* (US); *Setchell* (UC); *de Vriese 97* and *101* (M); *Warburg* (BS); *Waitz 164* (M); *Windoe 298* (BS); *Yates 2748* (UC).

Locality?: *Kuntze 3657* and *4426* (NY); *Schmurer 628* (NY).

P. Damrongianum is characterized by the form of the leaf and the ocrea, the position of the inflorescence, and the bristle-like hairs of the pedicel. An extremely wide range of forms is included under *P. chinense*, several of which have been described as species and varieties. In studying the very considerable bulk of material avail-

able, the variation in pubescence and in shape and size of leaves has been so confusing that it has seemed inadvisable to attempt any other segregations than the variety which follows. Samuelsson (pp. 181–182) has recently described two species, *P. adenopodum* and *P. umbrosum* from the neighborhood of *P. chinense*. The writer has not seen authentic material of these and has been unable to separate them with certainty from the variable run of specimens here cited under *P. chinense*. Fungus infection of the flowers and fruits often adds abnormality to the already variable natural morphology of these forms.

66a. **Polygonum chinense** L. var. **malaicum** (Danser) comb. nov.

P. malaicum Danser 218 (1927).

This variety differs strikingly from typical *P. chinense* in the size of its parts, particularly of the leaf blades and auricles: leaf blades ovate-cuspidate, up to 9 cm. broad and 14 cm. long, glabrous or pubescent beneath: auricles conspicuous and persistent, up to 2 cm. broad: fruit baccate and often 5 mm. thick.

CHINA. YUNNAN: *Henry 9078* (US), *9078-A* (NY).
FARTHER INDIA. SIAM: *Hosseus 355* (MBG). MALAY PENINSULA: *Burkill & Holttum 8424* (BS); *Henderson 17923* (UC); *McNair 11001* (UC).
EAST INDIES. SUMATRA: *Bartlett & La Rue 292* (BS); *Bunnemeyer 4077* (BS); *Forbes 1922* (GH); *McNair 7329* (BS); *Robinson & Kloss?* (US); *Yates 83* (BS), *534* and *1555* (UC).

67. **Polygonum runcinatum** Hamilt. ex D. Don, Prodr. Fl. Nep. 73 (1825); F. & H. 347; G. 406; Dan. 205; S. 180.

P. sinuatum Royle ex Bab. in Trans. Linn. Soc. xviii. 108 (1838).
P. truncatum Zoll. et Mor. in Nat. en Geneesk Arch. Neerl. Ind. ii. 214 (1845)—acc. to Dan. 207 = ssp. *javanum*.
P. panduriforme Lévl. et Van. in B. G. B. xi. 343 (1902)—acc. to S. l. c.
P. Morrisonense Hayata, Fl. Mont. Form. 185 t. xxxi. (1908)—acc. to Dan. l. c.
P. lyratum Nakai in B. M. T. xxxiii. 47 (1919).
Persicaria lyrata Nakai in Icon. Pl. Koisikav. iv. 89 (1921), in syn. = *P. lyratum*.
Persicaria Morrisonensis (Hay.) Nakai in Sasaki, List Pl. Form. 169 (1928).

A prostrate or ascending herb, pubescent or glabrous: leaves runcinate- or lyrate-pinnatifid, short-petiolate or sessile, usually auricled at the base: ocreae ciliate: heads of the inflorescence few, up to 1.5 cm. or more across; flowers white or pink; perianth 3–4 mm. long: achene swollen, obscurely triangular, 2–3 mm. long; surface opaque.

Southeastern Asia.

BRITISH INDIA. Assam: *Hooker & Thomson* (GH, M, BS). Sikkim: *Anderson 1132* (GH); *Cave* (BS); *Clarke 36170-B* (C); *Hooker* (GH); *Treutler 487* (NY). Eastern Himalayas: *Cave* (BS). Nepal: *Wallich* (C, M). Kumaon: *Strachey & Winterbottom 40* (GH, C, M). Kashmir: *R. R. Stewart 2899* and *5478½* (NY).

CHINA. Yunnan: *Ducloux 542* (GH, UC); *Forrest 22288* (UC); *Henry 10206-A* (2—sheets), *10213* and *11199* (NY); *E. E. Maire 168* (BS), *347* (UC), *1550* (UC, BS), *3660* (UC), *3660-B* (UC, BS), *6347* (UC), *6347-B* (US, BS) *7475* (GH, UC, BS), *7491* (UC), *7491-B* (US); *Rock 4483* (GH, UC, NY); *Schneider 2903* and *3686* (GH). Szechuan: *Pratt 115* (GH). Hupeh: *Henry 6954* (GH); *E. H. Wilson 805* (US, NY), *955* (NY).

FORMOSA. *Bartlett 6046a* (UC, US); *Kanehira & Sasaki 21806* (UC).

FARTHER INDIA. Siam: *Garrett 71* (UC).

PHILIPPINES. *Wilkes* (US).

EAST INDIAN ISLANDS. Java: *Setchell* (UC); *de Vriese* (M—2 sheets).

P. sinuatum and *P. lyratum* are separated on size and form of the leaves which characters do not appear sufficiently stable to merit specific designation. It is probable that good geographic varieties may be segregated when material from the area is better known.

68. **Polygonum nepalense** Meisn. Monogr. 84 t. vii. f. 2 (1826); Dan. 201; S. 180.

P. elatum Hamilt. ex D. 72 (1825), in syn.; Spreng. Syst. iv. Cur. Post. 154 (1827)—acc. to H. 41. *P. nepalense* is given as a syn.

P. punctatum Hamilt. ex D. l. c., not of Elliot or Rafin.—acc. to H. 41 = *P. alatum.*

P. perforatum Meisn. 83 (1826), excl. var. *glaciale*—acc. to H. 41 = *P. alatum.*

P. Metzianum Miq. in Flora xxxii. 557 (1849)—acc. to H. 42 = *P. alatum* var. *Metziana.*

P. microcephalum DC. ex Hassk. in l. c. xxxiv. 561 (1851)—acc. to M. in DC. 129 = c. *javanicum.*

P. capitatum Korth. ex de Br. in Miq. Pl. Jung. 309 (1854), in syn. = *P. punctatum* Don var. *pygmaeum.*

P. debile Steud. ex M. in DC. 129 (1856), in syn. = a. *glabrum.*

P. guttuliferum Miq. ex l. c. (1856), in syn. = a. *glabrum.*

P. quadrifidum Hayata in Journ. Coll. Sci. Tokyo xxx. Art. 1 p. 233 (1911) [Mater. Fl. Form.]

Persicaria alata (Hamilt. ex D. Don) Nakai, Fl. Quelpaert Is. 40 (1914).

A glabrous or sparsely pubescent annual: stems simple or branched, erect or creeping; 1–5 dm. long; usually glandular-pubescent beneath the inflorescence: leaves petiolate below and amplexicaul above; blades ovate or deltoid, tapering to the winged petiole, usually glandular-punctate, up to 5 cm. long: flowering heads usually subtended

by a sessile or amplexicaul leaf-like bract: achenes lenticular or triangular, enclosed by the perianth at maturity; surfaces striate and punctate. This species varies greatly in habit and in size of its parts.

Widely distributed in eastern Asia and in Africa.

BRITISH INDIA. CEYLON: *Thwaites 2251* (GH, C, NY); *Walker 149* (BS). MADRAS: *Hohenacker 968* (NY); *Sauliere* (BS), *131* (UC—2 sheets); *G. Thomson* (GH). BENGAL: *Clarke 35586-B* (C); *Gage* (GH); *Griffith 4122* (GH, T). ASSAM: *Griffith* (C); *Hohenacker 293* (M); *Hooker & Thomson* (GH—2 sheets, M—2 sheets); *Wallich & Griffith* (M). SIKKIM: *Hooker* (GH); *Kuntze 6737* and *6738* (NY). EASTERN HIMALAYAS: *Cave* (BS). NEPAL: *Gerard* (C). KUMAON: *Duthie* (UC); *Strachey & Winterbottom 9* (GH, M), *11* (GH). KASHMIR: *Schlagintweit 4312* (M), *13341* (GH); *R. R. Stewart* (NY), *3396* (MBG), *6773* (NY). NORTHWESTERN HIMALAYAS: *T. Thomson* (GH—3 sheets). WESTERN HIMALAYAS: *Duthie 22128* and *24908* (UC). HIMALAYAS: *Dudgeon & Kenoyer* and *135* (MBG); *Royle* (GH). WITHOUT LOCALITY: *Wallich* (T), *1701* (M), *1701-C* (GH); *Wight 2457* (GH, T).

AFGHANISTAN. *Aitchison 986* (GH).

CHINA. TIBET: *Schlagintweit 1852* (GH, M), *2260* (GH); *6409* (GH, M); *T. Thomson* (GH). YUNNAN: *Henry 9339* (NY—2 sheets), *9339-A* (US), *12662* (US), *12662-A* (NY); *E. E. Maire 158* (BS), *359* and *373* (UC), *7478* (UC, BS), *7478-B* (GH, UC); *Rock 5855* (GH, UC, US); *Schneider 2831* (GH). SZECHUAN: *W. P. Fang 1149* (NY). KANSU: *R. C. Ching 915* (UC). *Chihli: M. S. Clemens 8087* (BS); *Read 714* (UC). SHANTUNG: *M. S. Clemens 1372* (BS). HUPEH: *Bailey* (GH); *Y. Chen 696* (UC); *Henry 4996* and *5133* (GH), *5816* (C), *6953* (GH, NY); *C. F. Li 11211* (NY); *E. H. Wilson 1323* (NY). ANHWEI: *R. C. Ching 4164* (UC), *4198* (GH, UC). CHEKIANG: *C. Y. Chiao 1035* (UC). FUKIEN: *Dunn* [*HH 3440*] (GH). KIANGSI: *A. N. Steward 634* (UC, MBG, BS). KWANGTUNG: *Levine* [*CCC 1428*] (GH, MBG, US, BS); *Levine, McClure & To* [*CCC 6900*] (BS); *Merrill 10167* (BS), *11053* (UC, BS).

JAPAN. HOKKAIDO: *Maximowicz* (GH, T). HONDO: *Iishiba* (UC—2 sheets); *United States Nat. Herb. 1396945*. SHIKOKU: *Watanabe* (GH). LOCALITY?: *Watanabe* (OA).

FORMOSA. *Bartlett 6332* (UC, US); *Faurie 768* (BS); *Kanehira & Sasaki 21834* (UC); *Mori 694* (UC).

PHILIPPINES. LUZON: *M. S. Clemens 16346* (UC); *Curran* [*PFB 4384*] (US, BS); *Curran, Merritt & Zschokke* [*PFB 16055*] (US, BS); *Darling 51* (BS); *Elmer 6603* (US, NY, BS); *Loher 5207* (BS); *Mearns* [*PBS 4364* and *4368*] (BS); *Merrill 717* (US, BS), *9681* (MBG); *Ramos & Edano* [*PBS 40411*] (UC); *Vanoverbergh 254* (BS); *R. S. Williams 1147* (US, NY—2 sheets, BS).

EAST INDIES. SUMATRA: *Bunnemeyer 2545* and *4517* (BS); *Robinson & Kloss* (US). JAVA: *Forbes 795* (GH); *Korthals 33* (M); *Kuntze 4569* (NY); *de Vriese* (M—2 sheets); *Zollinger 2966* (GH). WITHOUT LOCALITY: *Jacquemont 773* (BS).

P. perforatum Meisn. has page priority over *P. nepalense*, but the identity of the second name is established beyond possible question by the accompanying plate and Danser has already accepted it. *P. quadrifidum* differs from *P. glaciale* in having biconvex achenes.

69. **Polygonum palmatum** Dunn in Kew Bul. 1912 p. 341.

P. Meeboldii W. W. Sm. in Rec. Bot. Surv. Ind. vi. 32 (1913).

An erect rather freely-branching roughly-pubescent herb: leaves long-petiolate; blades palmately 3–7-cleft, the lanceolate lobes acutely

tipped and separated by rounded sinuses, outline of the blades broadly ovate: ocreae membranous, loose, ovate, pubescent but eciliate, 1.5–2. cm. long: inflorescence branching; flowers in head-like clusters; perianth about 4 mm. long.

India.

FARTHER INDIA. INDO-CHINA: *Petelot 1618* (UC).

This remarkable species has been described by both Dunn and Smith from the same collection, Meebold 5730. It is unique in the genus because of its palmately cleft leaves.

70. **Polygonum microcephalum** D. Don, Prodr. Fl. Nep. 72 (1825); H. 42; G. 405.

P. ciliatum Hamilt. ex D. Don, 73 (1825)—acc. to Hook. f. l. c.

P. staticiflorum Wall. n. 1704 (1828), nom. nud.; M. in W. 60 (1832), in syn.

P. strigosum Hamilt. ex M. in W. l. c. (1832), in syn.

A glabrous or sparsely pubescent plant from a decumbent woody base: leaves with winged petioles (except the upper which are amplexicaul); blades ovate- or lanceolate-acuminate, tapering at the base into the winged petioles: ocreae tubular, truncate, usually finely ciliate: peduncles of the few-headed inflorescence slender and glabrous: heads 5–8 mm. in diameter.

The Himalayas, western and central China.

BRITISH INDIA. ASSAM: *Hooker & Thomson* (GH, C, BS); *Schlagintweit 216* (GH). SIKKIM: *Hooker* (GH); *Kuntze xi. 75* and *6671* (NY). NEPAL: *Wallich 1704-1* (M—2 sheets), *1704-2* (M).

CHINA. YUNNAN: *Henry 12071* (NY—2 sheets), *12071-A* (US)?: HUPEH: *Henry 6075* (GH, NY).

71. **Polygonum Wallichii** Meisn. Monogr. 83 t. vii. f. 1 (1826); H. 43; G. 406.

A slender mostly glabrous plant from a perennial creeping rootstock: stems decumbent or ascending: leaves petiolate, except the upper ones which are sessile; blades ovate-acuminate, 2–5 cm. long, margins ciliolate, bases sometimes cordate; petioles not winged: ocreae finely ciliate: flowering heads 6–8 cm. in diameter, hemispherical, on glabrous peduncles, usually in pairs though sometimes solitary or more numerous: achene triangular; surfaces granulate.

The temperate Himalayas.

BRITISH INDIA. NEPAL: *Wallich 1702* (GH, C, M).

72. **Polygonum Dielsii** Lévl. Cat. Pl. Yun. 206 (1916); S. 181.

P. jucundum Diels. in Not. Bot. Gard. Edinb. v. 257 (1912), not of Meisn.

Plant 3–6 dm. high, sparsely hairy above: lower leaves short-petiolate; blades sparsely hispid, lanceolate to oblong, acuminate, 5–8 cm. long and 2–3 cm. broad: ocreae fuscous, subhispid, longer than the petioles: flowering heads usually geminate, 5–8 mm. in diameter, on minutely scabrid peduncles; flowers purplish-pink; perianth about 3 mm. long.

Western China.

CHINA. YUNNAN: *Henry 9045* (US, AA), *9279* (US), *9279-A* (AA, NY—2 sheets), *9922* or *9982* (NY—2 sheets); *E. E. Maire 1556* (UC); *Schneider 2688* (US, AA).

The numbers cited above are given by Samuelsson, l. c. This species is very near *P. chinense*.

73. **Polygonum Strindbergii** Schuster in Bul. Herb. Boiss. II. viii. 712 (1908).

Stems ascending, weak, simple or sparsely branching: leaves long-petiolate, pubescent; blades broadly ovate-cordate, 2–4 cm. broad and 2.5–5. cm. long: ocreae cylindrical, pubescent, 5–15 mm. long and finely ciliate at the top: flowering heads geminate, 5–10 mm. in diameter, borne on glandular-hairy peduncles: perianth about 4 mm. long: achene triangular; surfaces granulate.

Western China.

CHINA. YUNNAN: *Henry 10499* (BS), *10499-A* (NY—2 sheets).

74. **Polygonum sphaerocephalum** Wall. n. 1703 (1828), nom. nud.; ex Meisn. in Wall. Pl. As. Rar. iii. 60 (1832); H. 43; G. 406.

P. podocephalum Klotzsch in Bot. Ergeb. Waldem. Reise 136 t. 86 (1862), in syn.

Plant with slender creeping stems from which short erect leafy branches arise: leaves petiolate; blades ovate-acuminate scabrid on the margins and sometimes on the veins beneath, .5–2.5 cm. broad, often tapering into the petioles: ocreae tubular, eciliate: flowering heads nearly spherical about 1 cm. in diameter, on glabrous peduncles: perianth longer than the ocreolae: achene triangular, surfaces finely granulate.

Temperate Himalayas.

BRITISH INDIA. NEPAL: *Wallich 1703* (M). *Kumaon: Strachey & Winterbottom 10* (GH). HIMALAYAS: *Dudgeon & Kenoyer 135a* (MBG); *Royle* (GH).

75. **Polygonum glaciale** (Meisn.) Hook. f. Fl. Br. Ind. v. 41 (1886); S. 179.

P. perforatum c. *glaciale* Meisn. in DC. 128 (1856).

A flaccid diffusely branched alpine dwarf: leaves with slender petioles equal in length to the ovate-obtuse blades: flowering heads sessile

or on short sparsely-glandular peduncles; outer bracts herbaceous with hyaline margins: achene triangular, black, finely striate.

Alpine Himalayas.

BRITISH INDIA. KUMAON: *Strachey & Winterbottom 44* (GH).

76. **Polygonum capitatum** Hamilt. ex D. Don, Prodr. Fl. Nep. 73 (1825); F. & H. 335; G. 407; S. 180.

P. repens Wall. n. 1699 (1828), nom. nud.; M. in W. 60 (1832)—acc. to H. 44.

Plant producing many stout creeping more or less pubescent leafy branches from a woody rootstock: leaves short-petiolate; blades coriaceous, brownish pubescent beneath (at least on the veins), broadly ovate, 1–5 cm. long; petioles often with small auricles at the base: ocreae flaring-oblique at the top, hispid and finely ciliate, up to 1 cm. long: inflorescence of 1 to a few spherical to ovoid heads on glandular-hairy peduncles terminating the leafy branches; heads 6–12 mm. thick, densely flowered; achene triangular, about 2 mm. long (or smaller); surfaces smooth and black.

The Himalayas and western China.

BRITISH INDIA. BENGAL: *Griffith 4123* (GH, T). ASSAM: *Clarke 38196-B* (C); *Hooker & Thomson* (M)?; *Wallich* (M). SIKKIM: *Hooker* (GH). NEPAL: *Wallich* (C). KUMAON: *Blinkworth* (C); *Strachey & Winterbottom 8* (GH, M). PUNJAB: *Schlagintweit 11366* (GH); *R. R. Stewart 1743* (UC, MBG, NY). NORTHWESTERN HIMALAYA: *Gray Herb.; T. Thomson* (GH, C, BS). HIMALAYAS: *Dudgeon & Kenoyer 67* (MBG). LOCALITY?: *Desilva* (C, M). WITHOUT LOCALITY: *Wallich* (M) and *1699-C* (GH).

CHINA. TIBET: *Strachey & Winterbottom 8* (M). YUNNAN: *Forrest 5513* (UC); *Henry 9665* (NY—2 sheets); *Rock 6616* (GH, UC, NY).

FARTHER INDIA. INDO-CHINA: *Petelot 686* (BS). BURMA: *Meebold 10860* (BS).

77. **Polygonum humile** Meisn. in Wall. Pl. As. Rar. iii. 59 (1832); H. 41; G. 403.

"*P. perforatum* Meisn." Wall. n. 1700 (1828)—acc. to Ind. Kew. where the name is attributed to Wall.

A small branching herb: plant more or less pubescent and glandular hairy: stems 5–15 cm. tall: leaves sessile or nearly so; blades ovate, sometimes tapering to the base, up to 2 cm. long, reduced in size upward: flowering heads about 5 mm. in diameter, on slender glandular-hairy peduncles: achene biconvex, about 1 mm. broad; surface coarsely pitted.

The Himalayas.

BRITISH INDIA. SIKKIM: *Gammie* (GH). NEPAL: *Wallich 1700* (C, M). KUMAON: *Strachey & Winterbottom 45* (GH).

78. **Polygonum filicaule** Wall. ex Meisn. in Wall. Pl. As. Rar. iii. 59 (1832); H. 25; G. 377.

P. alpestre Wall. Cat. n. 1725 (1828), nom. nud.—acc. to M. in DC. 128 = var. *alpestre*.

P. microphyllum Klotzsch ex Meisn. in DC. 128, in syn. = var. *alpestre*.

P. radicans Hemsl. in F. & H. 347 (1891).

P. minutum Hayata in Journ. Coll. Sci. Tokyo xxv. Art. 19 p. 185 t. xxx. (1908) [Fl. Mont. Form.]

Persicaria minuta (Hay.) Nakai in Sasaki, List. Pl. Form. 169 (1928).

A procumbent or ascending branching more or less strigose herb: branches slender, leafy, 5–25 cm. long: leaves petiolate: blades ovate, entire, 5–20 mm. long, strigose on both surfaces or nearly glabrous: flowers clustered in the axils of the upper leaves, on short pedicels: perianth glabrous, 5-cleft; fertile stamens 3 or 4: achenes sharply triangular, somewhat longer than the perianth; faces concave.

Temperate eastern Asia.

BRITISH INDIA. Bengal: *Wallich* (T). Sikkim: *Anderson 1131* (GH); *Hooker* (GH, M); *Smith & Cave* (BS—2 sheets). Eastern Himalayas: *Cave* (BS—2 sheets). Kumaon: *Strachey & Winterbottom 37* (GH); *Wallich 1694* (C, M—2 sheets). Kashmir: *R. R. Stewart 5660* (in part) and *6310* (NY). Hazára: *Inayat* (Duthie's collector) *20113* (UC). Himalayas: *Royle* (GH).
CHINA. Tibet: *Wallich 1725* (M). Yunnan: *Rock 10393* (GH, UC, US, NY). Szechuan: *Faber 244* (NY).

Meisner (in DC. 127) describes *P. filicaule* with 8 stamens, but Hooker (l. c.) found only 3 or 4. Diels[1] describes *P. radicans* with 3 fertile stamens. *P. radicans* is smaller than much of the Himalayan material of *P. filicaule*, but there are also small specimens from the Himalayas [e. g. R. R. Stewart 6310 (NY)]. *P. minutum* according to Hayata's plate (l. c.), has 8 stamens, but only 4 are fully developed. At present it does not seem possible to separate these forms specifically.

79. **Polygonum pilosum** (Maxim.) Forbes & Hemsl. in Journ. Linn. Soc. xxvi. 345 (1891).

Koenigia pilosa Maxim. in Bul. Acad. St. Pétersb. xxvii. 531 (1881) [Mél. Biol. xi. 308].

A slender herb, sparingly pilose: ocreae bearing at the base a dense tuft or border of white downward-pointing bristle-like hairs: leaves petiolate; blades ovate: flowers clustered in the axils of the upper leaves, on very short pedicels: perianth 4-cleft: anther-bearing stamens 2–5 (acc. to Maximowicz): achene triangular, included in the perianth at maturity.

[1] Diels in Not. Bot. Gard. Edinb. v. 258.

Northwestern China.

CHINA. KANSU: *R. C. Ching 594* (GH).

80. **Polygonum cyanandrum** Diels in Not. Bot. Gard. Edinb. v. 257 (1912).

Characters of *P. pilosum* except that the perianth is sometimes 5-cleft, the stamens are 8 and all are anther-bearing and the achene is somewhat exserted from the perianth at maturity.

Western China.

CHINA. YUNNAN: *Rock 5935* (GH, UC). KANSU: *R. C. Ching 517* (UC).

81. **Polygonum Huberti** Lingelsh. in Fed. Rep. Beih. xii. 360 (1922); S. 171.

A species doubtfully distinct from *P. cyanandrum:* distinguished by having smaller punctate leaf blades and glandular-dotted perianth.

Shensi Province, China.

Not seen.

82. **Polygonum delicatulum** Meisn. in DC. Prodr. xiv. 127 (1856); H. 24; G. 376; Diels in Not. Bot. Gard. Edinb. v. 258 (1912).

A delicate glabrous slender-stemmed herb: branches 5–15 cm. long: leaves sessile or rarely short-petiolate: blades ovate, 3–10 mm. long: flowers very small, in axillary clusters which scarcely exceed the ocreolae: achene sharply triangular, 2–3 times as long as the perianth at maturity; faces smooth and concave.

The alpine Himalayas.

BRITISH INDIA. BENGAL: *Clarke 13413* (US). SIKKIM: *Clarke 9904-A* (US); *Hooker 4* [Koenigia] (GH). KUMAON: *Strachey & Winterbottom 38* (GH—in part; C—2 sheets, M); *Wallich* (C). KASHMIR: *R. R. Stewart 3566* (UC, MBG).

CHINA. TIBET: *Herb. Bur. Sci.*

Section 5. ECHINOCAULON Meisn. in Wall. 58 (1832).

KEY TO SPECIES.

a. Ocreae (or some of them) expanding into herbaceous wings at the top....*b*
- *b.* Plant glabrous: leaves peltate.....83. *P. perfoliatum.*
- *b.* Plants more or less pubescent: leaves not peltate....*c*
  - *c.* Inflorescence in compact heads: achenes not shining....*d*
    - *d.* Achenes somewhat triangular....*e*
      - *e.* Ocreolae densely puberulent: achenes dull black: flowers not exserted beyond the ocreolae....*f*
        - *f.* Stipular auricles rounded and united into a nearly circular herbaceous sheath.....84. *P. senticosum.*
        - *f.* Stipular auricles linear-lanceolate, about 1.5 cm. long.....85. *P. sagittifolium.*

e. Ocreolae fringed with conspicuous cilia: achenes lemon-yellow or brown, roughened: flowers larger and some of them exserted.....86. *P. Thunbergii.*
d. Achenes biconvex.....87. *P. biconvexum.*
c. Inflorescence in open panicles, flowers few, scattered: stems weak: achenes brown and shining.....88. *P. debile.*
a. Ocreae membranaceous, not foliaceous or wing-tipped....*g*
g. Leaf blades oblong-cordate, often slightly sagittate, 4–15 cm. long and 2–8 cm. broad: axes of the inflorescence glandular-hairy (at least in fruit); flowers few and scattered in open panicles.....89. *P. dissitiflorum.*
g. Leaf blades linear to oblong or ovate, up to 10 cm. long and 2 cm. broad....*h*
h. Flowers sparsely arranged in forked panicles or simple racemes: stems slender, prostrate, rooting at the nodes: leaves short-petiolate; blades linear to lanceolate, sagittate, with obtuse lobes at the base: plant glabrous, or with a few recurved prickles at the nodes....90. *P. praetermissum.*
h. Flowers generally more densely arranged, not in forked panicles: stems usually erect and stouter....*i*
i. Achenes rotund, dull black; surfaces smooth, opaque 91. *P. Bungeanum.*
i. Achenes triangular or lenticular; surfaces striate or punctate to smooth and shining....*j*
j. Leaf blades bearing recurved prickles on the midrib beneath....*k*
k. Ocreolae glabrous and eciliate: achenes triangular; surfaces striate to punctulate or smooth and shining: leaf blades oblong to lanceolate, the bases sagittate.....92. *P. sagittatum.*
k. Ocreolae scabrous and ciliate: achenes lenticular or triangular; surfaces smooth: leaf blades ovate to lanceolate, the bases truncate, cordate, hastate or sagittate.....93. *P. strigosum.*

83. **Polygonum perfoliatum** L. Sp. Pl. ed. 2, p. 521 (1763); F. & H. 344; G. 411; C. 38; N. 18; Mat. 60; Mer. 123; Dan. 230; S. 183.

Chylocalyx perfoliatus (L.) Hassk. in Flora xxv. ii. Beibl. 20 (1842), based on *P. perfoliatum.*

Echinocaulos perfoliatus Meisn. ex Hassk. l. c. (1842), based on *P. perfoliatum.*

Tracaulon perfoliatum (L.) Greene, Leafl. i. 22 (1904).

Echinocaulon perfoliatum (L.) Hassk. ex Courchet in Lecomte, p. 38 (1910).

Persicaria perfoliata (L.) H. Gross in Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 113 (1919).

A glabrous rambling or climbing plant, herbaceous or woody at the base; stems flexuous: angles of the stem, petioles and main veins of the leaf blades armed with recurved prickles: leaves long-petiolate; blades peltate, deltoid, 1–6 cm. long: ocreae almost wholly herbaceous, expanded into nearly circular amplexicaul blades 5–30 mm. in diam-

eter: inflorescence terminal or in the axils of the upper leaves: spikes up to 2 cm. long: perianth white or pink, becoming fleshy and forming a blue berry-like fruit: achene spheroidal, 3–4 mm. in diameter, enclosed in the fleshy perianth; surface black, smooth and shining.

Widely distributed in eastern Asia.

BRITISH INDIA. Bengal: *Griffith 4125/1* (GH). Assam: *Clarke 42420-C* (C); *Hooker & Thomson* (GH, M). Sikkim: *Hooker* (GH). Nepal: *Wallich 1696/1* (M). Without Locality: *Wallich* (T).

SIBERIA. Amur: *Maximowicz* (GH). Locality? "Turga Roche"; *Bohnhof 323* (NY—2 sheets).

CHINA. Manchuria: *Maack 480* (GH). Yunnan: *Rock 6979* (GH, UC). Chihli: *M. S. Clemens 8054, 8054a* and *8054b* (BS). Shantung: *M. S. Clemens 1366* (BS); *Reymond 222* (BS). Hupeh: *Henry 1635* and *2332* (GH); *E. H. Wilson 2773* (NY). Anhwei: *R. C. Ching 4502* (GH, UC). Kiangsu: *Tsao* (BS). Chekiang: *Allison 24* (GH); *R. C. Ching 1817* (UC); *H. H. Hu 1472* (BS). Fukien: *Dunn* [*HH 3452*] (GH); *Metcalf & Chang 965* (UC). Kiangsi: *H. H. Hu 871* (BS); *A. N. Steward 559* (UC, MBG, BS). Kwangsi: *Groff 49* (BS). Kwangtung: *Groff* [*CCC 2393, 4211* and *4436*] (BS); *Levine* [*CCC 225*] (AA—in part, BS), [*CCC 495*] (GH, MBG, BS), [*CCC 3346*] (BS); *Merrill 10055* (BS); *To 1863* (UC); *Tsang & Wong 2549* (UC). Hongkong: *Ford* (MBG, NY). Hainan: *McClure 1865* (MBG, BS); *Tsang 508* and *564* (UC).

JAPAN. Hokkaido: *Arimoto* (GH, MBG); *Brooks* (UC). Hondo: *Maximowicz* (GH); *Watanabe* (GH, OA). Without Locality: *Herb. Lugd.-Bat. 201* (C).

FORMOSA. *Asai 21486* (UC); *Henry 457* (MBG, NY); *Mori 703* (UC); *Oldham 420* (GH).

FARTHER INDIA. Indo-China: *Petelot 685* (BS).

PHILIPPINES. Luzon: *Bona* (BS); *M. S. Clemens* (BS); *Elmer 5793* and *6261* (US, NY, BS), *8631* (MBG, US, NY); *Loher 4601* (US); *Mearns* [*PBS 2870*] (BS); *Merrill 747* (US, BS). Mindanao: *M. S. Clemens 2156* (UC); *Ramos & Edano* [*PBS 39020*] (US, BS).

EAST INDIES. Sumatra: *Korthals 161* (M). Java: *Koorders 28044-B* (UC); *Kuntze 4588* (NY); *Herb. Lugd.-Bat. 48* (M), *82* (NY).

Locality?: *Kuntze 6505* (NY).

Without Locality: *Herb. Hort. Bot. Bog.* (BS); *New York Bot. Gard.*

84. **Polygonum senticosum** (Meisn.) Franch. et Savat. Enum. Pl. Jap. i. 401 (1875); F. & H. 349; N. 18; Mat. 62.

Chylocalyx senticosus Meisn. in Miq. 65 (1865–66).

P. Babingtonii Hance in An. Sc. Nat. V. v. 239 (1866), not of Endl.—acc. to F. & H. l. c.

P. typhoniifolium Hance, l. c. (1866)—acc. to F. & H. l. c.

Persicaria senticosa (Meisn.) H. Gross in Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 113 (1919).

A plant similar in habit to *P. perfoliatum*, but differing in being finely pubescent, at least on the young shoots and axes of the inflorescence; leaves not peltate; blades usually more or less sagittate at the base: inflorescence often geminate, in head-like clusters up to 1 cm. in diameter: perianth equaling the achene at maturity, not fleshy: achene triangular; surface dull, brown.

China and Japan.

CHINA. Chihli: *J. C. Liu 1027* (UC). Shantung: *Zimmermann 590* (BS). Chekiang: *C. Y. Chiao 1358* (UC); *R. C. Ching 1702* (UC); *Y. L. Keng 723* (US). Fukien: *H. H. Chung 2362* and *3023* (GH, UC), *3612* and *3844* (UC); *Dunn* [*HH 3456*] (GH); *Fukien Chr. U. 3971, 4940, 5322, 6166, 6222, 6459, 11102, 11247, 11936, 12545, 12621* and *12728* (UC); *Metcalf 450* (UC). Kwangtung: *Levine* [*CCC 1363*] (GH, MBG, BS); *Merrill 10901* (BS); *To, Ts'ang & Ts'ang 467* (UC).

KOREA. *Gilbert 107* (UC); *Perry* (GH); *Wilford* (GH).

JAPAN. Hondo: *Arimoto* (GH, MBG); *Maximowicz* (GH, T). *Kiusiu:* Oldham *695* (GH). Liu Kiu: *Wright 252* (GH). Locality? "Simoda": *Williams & Morrow* (GH—2 sheets); *Wright*. Without Locality: *Faurie 3601* (BS); *Herb. Lugd.-Bat.* (GH, C), *10* (GH, M), *17* (NY), *193* (C). *Univ. Tokyo 1515* (BS).

FORMOSA. *Faurie 761, 764* and *1184* (BS); *Oldham 419* (GH, C); *Sasaki 21576* (UC); *Simada 705* (UC).

85. **Polygonum sagittifolium** Lévl. et Van. in Bul Géogr. Bot. xi. 342 (1902); S. 183.

P. Darrisii Lévl. in Fed. Rep. xi. 297 (1912)—acc. to S. l. c.

A species near *P. senticosum* but characterized by linear-lanceolate stipular auricles and sagittate leaves.

Southwestern China.

Not seen.

86. **Polygonum Thunbergii** Sieb. et Zucc. Fl. Jap. Fam. Nat. ii. 84 (1846); F. & H. 351; N. 17; Koid. in Journ. Col. Sci. Tokyo xxvii. Art. 13 p. 51; Mat. 63; Hultén in Kungl. Sv. Akad. Handl. III. v. No. 2, p. 55 [Fl. Kamtch.].

"*P. arifolium* L." Thunb. Fl. Jap. 168 (1784). *P. Thunbergii* is based on this description.

P. debile Meisn. b. *hastatum* Meisn. in Miq. 63 (1865-66).

P. stoloniferum F. Schmidt in Mém. Acad. Sci. St. Pétersb. xii. No. 2, p. 168 (1868) [Reis. Amurl.]—acc. to F. & H. l. c.

Tracaulon Thunbergii (Sieb. & Zucc.) Greene, Leafl. i. 22 (1904).

Persicaria Thunbergii (Sieb. & Zucc.) H. Gross in Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 114 (1919).

A branching decumbent pubescent herb armed with recurved prickles and often with flowering and fruiting stolons at the base: leaves petiolate; petioles often narrowly winged; blades hastate, up to 10 cm. long, basal lobes unequal: ocreae short, often topped by an herbaceous wing: inflorescence in few-flowered clusters paniculately arranged and borne on glandular peduncles; some of the flowers exserted: ocreolae coarsely ciliolate: perianth pink or white, about 6 mm. long: achene 3.5–5 mm. long, somewhat 3-angled; surface smooth, opaque.

Continental eastern Asia.

BRITISH INDIA. ASSAM: *Hooker & Thomson* [*Polygonum 58*] (GH, M).
SIBERIA. SAKHALIN: *Augustinowicz* (BS); *Glehn* (GH); *Schmidt* (M).
CHINA. MANCHURIA: *Komarov 554* (GH). YUNNAN: *Henry 9923* (NY), *9923-A* (BS), *11351* (NY—2 sheets). SZECHUAN: *Henry 7258* (NY). HUPEH: *Y. Chen 989* (UC); *S. S. Chien 5452* (UC); *Henry 5080* and *7414* (GH); *E. H. Wilson 1039* (NY). ANHWEI: *R. C. Ching 4469* and *4527* (UC). CHEKIANG: *R. C. Ching 3832* (UC). HAINAN: *K. K. Tsoong 4318* (BS).
FARTHER INDIA. INDO-CHINA: *Petelot 1622* (UC).

The specimen Hooker & Thomson [Polygonum 58] cited by Meisner to illustrate his *P. debile* b. *hastatum* appears to be an undeveloped plant of *P. Thunbergii*.

86a. **Polygonum Thunbergii** Sieb. et Zucc. var. **hastato-trilobum** (Meisn.) Maxim. ex Fr. et Savat. Enum. Pl. Jap. ii. 475 (1879); Mat. 63.

P. hastato-trilobum Meisn. in Miq. 62 (1865–66).
P. pteropus Hance in Journ. Bot. 1869, p. 167.
Tracaulon hastato-trilobum (Meisn.) Greene, Leafl. i. 22 (1904); Dan. 224.

This variety differs from the type in having the inflorescence in head-like several- to many-flowered clusters: ocreae usually with a well-developed herbaceous wing: leaf blades mostly larger and more definitely lobed.

Japan, rarely in China and Formosa.

CHINA. CHIHLI: *M. S. Clemens 8052* (BS). CHEKIANG: *R. C. Ching 3598* (UC); *K. K. Tsoong 4317-A* and *4317-B* (BS). KWANGTUNG: *Y. Tsiang 1218* (UC).
JAPAN. HOKKAIDO: *Arimoto* (MBG). *Brooks 381* and *383* (UC); *Maries* (GH); *Maximowicz* (GH); *Herb. Sapporo Agric. Col.* (GH). HONDO: *Iishiba* (UC—2 sheets); *Herb. Bur. Sci. Manila; Maximowicz* (GH, T); *Watanabe* (OA). KIUSIU: *Oldham 694* (GH); *Tanaka 200180* (UC). WITHOUT LOCALITY: *Hogg* (C); *Herb. Lugd.-Bat.* (GH—2 sheets, MBG, NY), *1* (M), *174* (C), *202* (M).
FORMOSA. *Mori 707* (UC).

Meisner describes the peduncles of *P. hastato-trilobum* as "eglandular," but specimens from his herbarium and labeled by himself have glandular hairs on the peduncles. *P. pteropus* is said to differ from *P. hastato-trilobum* "by the glandular-hairy peduncles, and the winged petioles."

86b. **Polygonum Thunbergii** Sieb. et Zucc. var **Maackianum** (Regel) Maxim. ex Franch. et Savat. Enum. Pl. Jap. ii. 475 (1879); Mat. 63.

P. Maackianum Regel in Mém. Acad. Sci. St. Pétersb. iv. No. 4, p. 127 t. x. f. 1 & 2 (1861) [Tent. Fl. Ussur.].
Tracaulon Maackianum (Regel) Greene, Leafl. i. 22 (1904).
Persicaria Maackiana (Regel) Nakai in Mori, Enum. Pl. Cor. 132 (1922).

The plant is distinguished by having ocreae in which the expanded herbaceous wings are conspicuously dentate, each point being tipped by a strong bristle-like hair. The leaf-blades are usually much narrower than in the typical form.

Temperate and subtropical eastern Asia.

CHINA. Chihli: *M. S. Clemens 8052a* (BS). Kiangsu: *Herb. U. Nanking 228* (UC, MBG, BS).
JAPAN. Hondo: *Watanabe* (GH).
FORMOSA. *Oldham 431* (GH); *Sasaki 702* (UC).

86c. **Polygonum Thunbergii** Sieb. et Zucc. var. **stellato-tomentosum** (W. W. Sm. et Ramas) comb. nov.

P. stellato-tomentosum W. W. Sm. et Ramas in Rec. Bot. Surv. Ind. vi. 33 (1913).

This variety differs from typical *P. Thunbergii* in being stellate-tomentose, in having ocreae with obtusely lobed herbaceous wings, and in having the inflorescence in paniculately arranged 2–6-flowered heads.

British India, between Assam & Burma.

Not seen.

87. **Polygonum biconvexum** Hayata in Journ. Coll. Sci. Tokyo xxv. Art. 19, p. 184 [Fl. Mont. Form.] (1908).

P. hastatotrilobum Meisn. var. *lenticulare* Dan. 227 fig. 14 (1927).

P. biconvexum is given as a syn.

This species is described as being very near to *P. Thunbergii* from which it differs in having biconvex achenes. If this difference proves to be inconstant the plant should be treated as a variety of that species.

Tropical and subtropical eastern Asia.

FORMOSA. *Faurie 752* and *755* (BS).

88. **Polygonum debile** Meisn. in Miq. 63 (1865–66) [excl. b. *hastatum*]; Mat. 56.

Persicaria debilis (Meisn.) Gross ex Nakai, Fl. Quelp. Is. 40 (1914).

A slender creeping plant: stems thin and flexible: leaves petiolate; blades hastate or deltoid, membranous, 2–6 mm. long: inflorescence lax; heads 2–5-flowered, scattered; flowers somewhat exserted at maturity: perianth about 4 mm. long in fruit: achenes smooth and brown.

JAPAN. Hondo: *Arimoto* (MBG); *Watanabe* (GH). Kiusiu: *Maximowicz* (GH, T). Without Locality: *Herb. Lugd.-Bat. 24* (GH, NY).

Concerning var. *hastata*, the writer has seen only the Hooker & Thomson [*Polygonum* 58] cited by Meisner, and this appears to be an undeveloped specimen of *P. Thunbergii*.

89. **Polygonum dissitiflorum** Hemsl. in Journ. Linn. Soc. xxvi. 338 (1891); N. 17.

P. glanduliferum Nakai, 20 t. I. f. 1. (1908).

Plant annual, branching; internodes slender and elongated; stems .5–1. m. tall, sparsely armed with fine prickles: leaves petiolate; blades membranous oblong-cordate, somewhat hastate, up to 15 cm. long, tips acuminate: ocreae lax, weakly ciliate: flowers not in heads but few and widely scattered on an openly paniculate glandular-pubescent or nearly glabrous inflorescence: ocreolae ciliolate: perianth 4–5 mm. long, enclosing the smooth spheroidal or obscurely triangular achene.

Eastern China and Korea.

CHINA. Manchuria: *Komarov 556* (GH, BS). Anhwei: *R. C. Ching* 4145 and 4205 (UC). Chekiang: *Cheo* and *Wilson 128* (GH, UC); *C. Y. Chiao 1063* (UC); *R. C. Ching 4706* (UC); *Y. L. Keng 581* and *1005* (UC). Kiangsi: *A. N. Steward 562* (UC, US, BS). Locality?: "M. Tsien Mts.": *Faber 1767* (BS).

Examination of the figure of *P. glanduliferum* leaves no doubt that it is a large-leaved glandular-hairy form of *P. dissitiflorum*.

90. **Polygonum praetermissum** Hook. f. Fl. Br. Ind. v. 47 (1886); F. & H. 347; Mer. 124.

P. muricatum b. *auriculatum* Meisn. in DC. 133 (1856).

P. birmanicum Gage, 412 (1903).

Tracaulon praetermissum (Hook. f.) Greene, Leafl. i. 22 (1904).

A usually simple-stemmed and nearly unarmed herb: stem creeping and rooting at the base, ascending at the tip; armed with reflexed bristles in the vicinity of the nodes: leaves short-petiolate; blades linear to oblong, 1–5 cm. long, bases sagittate, tips of the lobes and of the blades obtuse: ocreae tubular, truncate, pubescent, or nearly glabrous: flowers few, exserted at maturity, scattered in glabrous or glandular pubescent simple or forked racemes: perianth 2–3 mm. long: achene weakly triangular.

Tropical and subtropical eastern Asia.

BRITISH INDIA. Ceylon: *Thwaites 2250* and *3348*? (GH). Bengal: *DeSilva* (US); *Griffith 4125* (GH). Assam: *Hooker & Thomson* (GH); *Schlagintweit 386* (M).

CHINA. Hupeh: *Henry 3659* (GH).

JAPAN. Hondo: *Tanaka 140* (US). Liu Kiu: *Faurie 4219*? (BS).

PHILIPPINES. Luzon: *M. S. Clemens 18731* (UC); *Loher 4598*? (US, BS); *Merrill 1713* (GH, MBG), *4521* (US, NY, BS), *7705* (US, BS), *7749* (BS).

The Schlagintweit specimen cited above, labeled in Meisner's hand "*Polygonum muricatum* b. *auriculatum* nob." is unquestionably *P. praetermissum*.

Gage describes *P. birmanicum* as "near to *P. praetermissum*, but distinguished therefrom by its much longer, quite glabrous and eglandular racemes." Hooker describes *P. praetermissum* with "simple glabrous axillary racemes," but there are specimens with the inflorescence of *praetermissum* showing various stages from glabrous to rather densely glandular-pubescent.

91. **Polygonum Bungeanum** Turcz. in Bul. Soc. Nat. Mosc. 1840, p. 77; F. & H. 335.

"*P. pensylvanicum* L." Bunge, Enum. Pl. Chin. Bor. 57 (1831)—acc. to M. in DC. 120 where attributed to Bunge.

P. Chaneti Lévl. in Bul. Soc. Bot. France liv. 370 (1907)—acc. to Samuelsson.[1]

Persicaria Bungeana (Turcz.) Nakai in Mori, Enum. Pl. Cor. 131 (1922).

Erect herb: stem sparsely recurved-prickly below: leaves petiolate; blades ovate-lanceolate; ocreae, petioles and midveins appressed-pilose: peduncles and upper stems glandular-pubescent, the glands long-stipitate: spikes laxly-flowered, 2–3 cm. long: ocreolae eciliate: flowers exserted; perianth about 3 mm. long: achene rotund, about 3 mm. in diameter; surface smooth and opaque, dull black.

North China.

CHINA. Shansi: *K. Ling 1635* (UC). Chihli: *M. S. Clemens 8063* (BS).

This species shows considerable resemblance to species in § *Persicaria*, but the presence of recurved prickles on the stem show clearly that it must be placed in § *Echinocaulon*.

92. **Polygonum sagittatum** L. Sp. Pl. 363 (1753); F. & H. 348; G. 411; N. 15; Mat. 61.

P. Sieboldi Meisn. in DC. 133 (1856)—acc. to F. & H. l. c.

Tracaulon sagittatum (L.) Small, Fl. S. E. U. S. 381 (1903).

Tracaulon sibiricum (Meisn.) Greene, Leafl. i. 22 (1904) = a. *sibiricum* Meisn. in DC. 132.

Tracaulon Sieboldii (Meisn.) Greene, l. c. (1904).

Persicaria sagittata (L.) H. Gross in Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 113 (1919).

Persicaria Sieboldii (Meisn.) Ohki, in Sasaki List Pl. Form. 170 (1928).

A usually glabrous herb: angles of the stem, petioles, and midribs of the leaf blades with recurved prickles: leaves petiolate; blades oblong to lanceolate, margins smooth: inflorescence of a few capitate heads: achenes striate, punctulate or smooth and shining, about equal to the perianth and subtended by glabrous acuminate or cilia-tipped ocreolae.

[1] Samuelsson according to notes in letter from Dr. W. W. Smith.

Temperate regions of eastern North America and eastern Asia.

BRITISH INDIA. Assam: *Hooker & Thomson* (GH).
SIBERIA. Amur: *Korshinsky* (GH). Locality? ("Turga Roche"): *Bohnhof 190* (NY—2 sheets).
CHINA. Mongolia: *Karo 315* (MBG—2 sheets); *Sosnin* (C). Manchuria: *Komarov 555* (GH, BS). Yunnan: *E. E. Maire 6371, 6371-B* [leaf blades pubescent above!] and *6446* (GH, UC), *6446-B* (BS), *7481* (UC), *7481-B* (UC, BS). Chihli: *M. S. Clemens 8053* and *8053a* (BS); *Read 713* (UC). Shantung: *M. S. Clemens 1373* (BS). Hupeh: *Y. Chen 646* (UC); *Henry 5042* or *4951*? (GH); *E. H. Wilson 2630* (NY)?
JAPAN. Hokkaido: *Arimoto* (GH); *Brooks 386* (UC), *Maximowicz* (GH). Hondo: *Arimoto* (MBG); *Maximowicz* (T); *Tanaka 100277* (UC—2 sheets), *200283* (UC); *Watanabe* (OA). Shikoku: *Watanabe* (GH). Without Locality: *Faurie 723* (BS); *Herb. Lugd.-Bat.* (GH), *18* and *199* (M); *Williams & Morrow* (GH).

From the study of the specimens at hand, particularly those of continental northeastern Asia, it would appear that Maximowicz was thoroughly justified in his observation cited in the note below[1] and that *P. Sieboldii* can hardly be considered as specifically distinct from *P. sagittatum*. All the specimens seen from the Meisner Herbarium are from Japan, in which area the character of striate or punctulate achenes appears to be relatively constant.

92a. **Polygonum sagittatum** L. var. **ussuriense** Regel, Tent. Fl. Ussur. 126 (1891); Komarov in A. H. P. xxii. 133 (1904) [Fl. Manshur.].

P. Korshinskianum Nakai in Journ. Coll. Sci. Tokyo xxxi. 169 (1911) [Fl. Kor. II.] excl. syn.

P. ussuriense (Regel) Nakai in Mats. Icon. Pl. Koisk. iv. 49 t. 237 (1919). *P. Korshinskianum* and *P. sagittatum* var. *ussuriense* are given as syn.

Persicaria ussuriensis (Regel) Nakai in Mori, Enum. Pl. Cor. 134 (1922).

This variety differs from the typical form of *P. sagittatum* in having ciliate ocreae, glandular-pilose peduncles, and leaf blades with margins recurved-prickly.

Continental northeastern Asia.

Not seen.

93. **Polygonum strigosum** R. Brown, Prodr. Fl. Nov. Hol. 420 (1810); F. & H. 350; G. 411; C. 38; Mat. 62; Dan. 227, f. 15.

P. arifolium Spreng. Syst. ii. 258 (1825). *P. strigosum* is given as a syn.

[1] Maximowicz in Mél. Biol. ix. 617–8 "*P. Sieboldii* Meisn. a *P. sagittato* fructu opaco-scrobiculato distinctum dicitur, occurrit tamen in Japonia mox puncticulato-impressus, mox tantum opacis laevis, mox imo nitidulus, nequaquam igitur a *P. sagittato* L. specie distinguendum. In Mandshuria finitima cum typico crescens collegi."

"*P. sagittatum* L." D. Don, 73 (1825)—acc. to H. 47, where attributed to Don.

"*P. muricatum* Meisn." Wall. n. 1697 (1828)—acc. to H. 47, where attributed to Wall.

P. horridum Hamilt. ex Roxb. Fl. Ind. ii. 291 (1832)—acc. to H. 47, where attributed to Roxb.

P. auriculatum herb. Hook. f. & Thoms. in H. 47 (1886)—in syn.

Tracaulon strigosum (R. Br.) Greene, Leafl. i. 22 (1904).

Persicaria strigosa (R. Br.) Nakai in Sasaki, List Pl. Form. 170 (1928).

An herb up to 1 m. tall; more or less prickly on the stems, petioles and midveins of the leaf blades beneath: leaves petiolate; blades oblong to lanceolate, bases truncate, cordate or sagittate, margins often strigose or recurved-prickly: ocreae short-ciliate: inflorescence of oblong or sub-globose heads borne on glandular-hairy or scabrous peduncles: ocreolae ciliate and strigose: achenes lenticular or triangular, punctulate, opaque or smooth and shining, included in the perianth.

Australia, the East Indian Islands and eastern Asia.

BRITISH INDIA. MADRAS: *Hohenacker 969* (C); *Sauliere* (BS) and *62* (UC—2 sheets). BENGAL: *Desilva* (M); *Griffith 4124* (GH); *Hooker & Thomson* (GH, M); *T. Thomson* (GH). ASSAM: *Jenkins 505* (GH); *Wallich* (M). SIKKIM: *Clarke 36946-C* (C). NEPAL: *Wallich* (MBG) and *1697/1* (M). KUMAON: *Strachey & Winterbottom 7* (GH, C). HIMALAYAS: *Dudgeon & Kenoyer* (MBG). WITHOUT LOCALITY: *Wallich!* (US); *Wight 2456* (GH, T).
SIBERIA. LOCALITY? "Turga Roche"; *Bohnhof 185-C* (NY—2 sheets).
CHINA. MANCHURIA: *Komarov 555* (GH). YUNNAN: *Forrest 11992* (UC); *Henry 12187* (NY). KWANGTUNG: *Levine* [*CCC 1412*] (GH, MBG, US, BS); *Merrill 10808* (UC, BS). LOCALITY? "Maipo": *Hongkong Herb. 11176* (BS).
PHILIPPINES. LUZON: *Merrill 9683* (BS).

KEY TO VARIETIES.

Inflorescence openly paniculate; flowers about 3 mm. long
93a. var. *muricatum*.
Inflorescence a rather dense panicle; flowers 4–5 mm. long
93b. var. *hastato-sagittatum*.
Inflorescence spicate.
Leaves 1–3 cm. long.....93c. var. *benguetense*.
Leaves 4–8 cm. long.
Ocreolae glabrous but with ciliolate margins; leaves usually not prickly.....93d. var. *pedunculare*.
Ocreolae strigose; leaves prickly on petioles and midveins beneath.....93. *P. strigosum* (typical).

93a. **Polygonum strigosum** R. Br. var. **muricatum** (Meisn.) comb. nov.

P. muricatum Meisn. Monogr. 74 (1826)—acc. to Benth. Fl. Austral. v. 268 = *P. strigosum*.

P. asperulum Wall. n. 1724 (1828), nom. nud.; ex M. in W. 58 (1832), in syn. = *P. muricatum.*

P. auriculatum Mak. in B. M. T. xvii. 117 (1903), not of Meisn.

P. breviochreatum Mak. l. c. (1903).

Tracaulon muricatum (Meisn.) Greene, Leafl. i. 22 (1904).

A plant of the *P. strigosum* group characterized by openly paniculate inflorescence and by ocreolae that are usually glabrous but with ciliolate margins: leaves often ovate in outline.

Southeastern Asia.

BRITISH INDIA. Assam: *Clarke 40419-C* (C); *Wallich* (C). Nepal: *Wallich* (MBG), *1724* (M).

CHINA. Hupeh: *Henry 7408* (GH). Anhwei: *R. C. Ching 4516* (UC, US). Fukien: *Fukien Chr. U. 2892* (UC); *Metcalf & Chang 566* (UC). Kwangtung: *Levine* [*CCC 1539*] (GH, MBG, BS); *Merrill 11025* (UC, BS), *11195* (BS).

P. auriculatum is said to differ from *P. muricatum* "by its angustate leaves, the lateral peduncle, and the black-castaneous ruguloso-reticulated achene." *P. breviochreatum* differs "by the narrow leaves and the ovoid-globose achene."

93b. **Polygonum strigosum** R. Br. var. **hastato-sagittatum** (Mak.) comb. nov.

P. hastato-sagittatum Mak. in B. M. T. xvii. 119 (1903).

P. nipponense Mak. op. cit. xxiii. 89 (1909). *P. hastato-sagittatum* var. *latifolium* is given as a syn.

P. Cavaleriei Lévl. in Fed. Rep. viii. 172 (1910)—acc. to S. 182 = *P. hastato-sagittatum.*

P. oliganthum Diels in Not. Bot. Gard. Edinb. v. 260 (1912)—acc. to S. l. c. = *P. hastato-sagitattum.*

Persicaria nipponensis (Mak.) Nakai, Fl. Quelpaert Is. 41 (1914).

Persicaria hastato-sagittata (Mak.) Nakai in Mori, Enum. Pl. Cor. 132 (1922).

The inflorescence in this variety is intermediate between the open panicles of var. *muricatum* and the spikes of the remaining forms of *P. strigosum.* The flowers are large, often 4–5 mm. long.

China and Japan.

CHINA. Yunnan: *E. E. Maire 157* (UC, BS). Chekiang: *Allison 28* (GH); *K. K. Tsoong 4322* (BS).

JAPAN. Hondo: *Faurie 5132* (BS); *Tanaka 200642* (UC); *Watanabe* (OA—2 sheets, US). Kiusiu: *Maximowicz* (GH). Without Locality: *United States Nat. Herb. 206136.*

93c. **Polygonum strigosum** R. Br. var. **benguetense** (Merr.) comb. nov.

P. benguetense Merr. in Philipp. Journ. Sci. x. Bot. 301 (1915).

A variety with very slender sparsely-branching stems and small (1–3 cm. long) elliptic to ovate leaves, and almost without barbs or prickles.

Insular southeastern Asia and south China.

CHINA. KWANGTUNG: *Levine* [*CCC 20*] (MBG, BS); *McClure 335* (BS).
FORMOSA. *Faurie 751* and *765* (BS).
PHILIPPINES. LUZON: *Merrill 768* and *8008* [Type] (BS), *9682* (US, BS); *C. B. Robinson* [*PBS 14120*] (BS).

93d. **Polygonum strigosum** R. Br. var. **pedunculare** (Wall. ex Meisn.) comb. nov.

P. dichotomum Blume, Bijdr. 529 (1825); Dan. 222. *P. pedunculare* is given as a syn.

P. hispidulum Blume, op. cit. 535—acc. to Dan. l. c. = *P. dichotomum.*

P. tetragonum Blume, l. c.—acc. to Dan. l. c. = *P. dichotomum.*

P. glabratum Meisn. ex Wall. n. 6285 (1828), nom. nud.; M. in W. 58 (1832), in syn. = *P. pedunculare.*

P. muricatum Meisn. var. *glabratum* Wall. ex M. in W. l.c. (1832), in syn. = *P. pedunculare.*

P. pedunculare Wall. n. 1718 (1828), nom. nud.; ex M. in W. l. c. (1832).

Tracaulon hispidulum (Blume) Greene, Leafl. i. 22 (1904).

Tracaulon pedunculare (Wall.) Greene, l. c. (1904).

Tracaulon tetragonum (Blume) Greene, l. c. (1904).

An herb of variable habit: stems armed with recurved prickles or nearly smooth: leaves petiolate; blades variable, but usually without prickles: ocreae finely ciliate: inflorescence of oblong or globose spikes often dichotomously arranged on glandular-hairy or glabrous peduncles: ocreolae usually glabrous but with ciliolate margins: achene triangular or biconvex, included in the perianth.

Eastern Asia to Australia.

BRITISH INDIA. MADRAS: *G. Thomson* (GH). ASSAM: *Masters* (GH); *Hooker & Thomson* (GH); *Prain's collector 54* (US). WITHOUT LOCALITY: *Wight 2460* (GH).

CHINA. YUNNAN: *Henry 11918-A* (NY—2 sheets). HUPEH: *Henry 2793* (GH). ANHWEI: *R. C. Ching 4348* (UC, US). KIANGSU: *Soochow U. 237* (UC). CHEKIANG: *Cheo & Wilson 234* (GH, UC—2 sheets); *R. C. Ching 1700* (GH, UC, US). FUKIEN: *H. H. Chung 2158* and *2576* (UC); *Dunn* [*HH 3454*] (GH)?; *Fukien Chr. U. 1232, 2896, 3148, 5909, 6859, 11276, 11422, 11558* and *11687* (UC); *Hance & 1482* (GH). KWANGTUNG: *W. Y. Chun 5500* (UC); *Levine* [*CCC 218*] (MBG, BS), [*CCC 1647*] (GH, MBG, US, BS), [*CCC 2155*] (MBG—2 sheets, BS); *McClure 1312* and *1745* (UC); *To, Tsang & Tsang 468* and *695* (UC, US); *Tsang & Wong 2966* (UC). HAINAN: *Katsumata 22044* (UC); *Tsang 371* (UC), *730* (UC, NY). HONGKONG: *Y. Tsiang 730* (UC).

JAPAN. Liu Kiu: *Boehmer 219* (NY)?
FORMOSA. *Faurie 759* (BS); *Henry 2027* (US, NY—3 sheets, BS); *Oldham 435* (GH); *Sasaki 706* (UC).
FARTHER INDIA. Indo-China: *Petelot 791* (BS), *800* (UC). Burma: *King's collector 156* (BS). Malay Peninsula: *Burkill 2512* and *2823* (BS); *Cuming 2281* (MBG); *Haniff 1214* (BS); *Herb. Bur. Sci. Manila; Ridley* (MBG, BS—3 sheets), *11957* (BS); *Wallich 1718* (US).
PHILIPPINES. Luzon: *Cuming 484* (BS); *Elmer 7729* (MBG, US, NY, BS), *18313* (GH, UC, MBG, BS). Mindoro: *McGregor 173* (BS). Mindanao: *M. S. Clemens & 196* (BS); *Fenix* [*PBS 24997*] (US, BS).
EAST INDIAN ISLANDS. Borneo: *Endert 3231* (UC); *Herb. Lugd.-Bat. 35* (C); *Mjoberg 130* (UC). Sumatra: *Korthals 125*, *148* and *155* (M); *Herb. Lugd.-Bat. 45* (M). Java: *v. Brink 4546* (BS); *Blume 117* (US); *Herb. Lugd.-Bat.* (GH), *61* (C), *64* (NY), *79* (M); *de Vriese* (C). Celebes: *Herb. Lugd.-Bat. 56* (M); *v. Vuuren 316* (UC).

The plants here included under *P. strigosum* and its varieties are an exceedingly variable group. Perhaps further study will reveal definite characters by which some of these parts may be separated as distinct species.

Section 6. TINIARIA Meisn. 43, 62 (1826) and in DC. 135 (1856) [including § *Pleuropterus* (Turcz.) Benth. & Hooker. Gen. Pl. iii. 99 (1880)].

Meisner's treatment appears to be more nearly correct than that of Bentham & Hooker, followed by Engler & Prantl (Pflanzenfam. III. l. a. 29), by which Turczaninow's genus *Pleuropterus* is set off as a section which is made to include some species with twining and others with erect habit, especially since the distinctions to be used in separating the section are not clearly defined. Had *Pleuropterus* been based upon one of the species with erect habit, e. g. *cuspidatum*, it would have better claim to sectional standing distinct from *Tiniaria*. However, the species of this section are variable and it does not seem justifiable to set off such a section.

Key to Species.

a. A softly hairy twining herb.....94. *P. cyanchoides.*
a. Plants glabrous or nearly so: twining or erect: herbaceous or shrubby....*b*
  b. Perianth not winged or rarely slightly winged in fruit.95. *P. Convolvulus.*
  b. Perianth broadly winged in fruit....*c*
    c. Plants with twining stems....*d*
      d. Plants definitely herbaceous....*e*
        e. Wings of the fruit prolonged little, if at all, along the pedicel; fruit, including pedicel, about 1 cm. long.....96. *P. dumetorum.*
        e. Wings of the fruit prolonged towards the base of the pedicel; fruit, including pedicel, 1.5–2 cm. long....*f*
          f. Inflorescences elongated, surmounting the leaves, heavily flowered.....97. *P. scandens.*

f. Inflorescences more fascicled, shorter than the leaves, sparsely flowered.....98. *P. pterocarpum.*

d. Plants woody, at least at the base....*g*

g. Branches woody: leaves often appearing fascicled on short shoots borne at the nodes, long-petiolate; blades lanceolate to cordate, tips rounded to acuminate: inflorescence of terminal or axillary panicles: flowers long-pedicelled, the pedicels winged above; perianth winged, 5–8 mm. broad; filaments pubescent....*h*

h. Ocreolae and axes of the inflorescence glabrous 99. *P. baldschuanicum.*

h. Ocreolae and axes of the inflorescence finely glandular-pubescent.....100. *P. Auberti.*

g. Branches herbaceous: leaves not so usually fascicled and more generally cordate-acuminate: inflorescence profusely branched; ocreolae and axes finely glandular-pubescent; flowers with winged pedicels, but only 1–2 mm. broad; filaments glabrous.101. *P. multiflorum.*

c. Plants with erect stems, semi-shrubby....*i*

i. Leaf blades 10–30 cm. long, truncate or shallowly cordate at the base: inflorescence of slender panicles, rather laxly flowered.....102. *P. sachalinense.*

i. Leaf blades 5–10 cm. long; bases rounded, truncate or cuneate: panicles of the inflorescence shorter and more densely flowered.....103. *P. cuspidatum.*

94. **Polygonum cynanchoides** Hemsl. in Journ. Linn. Soc. xxvi. 338 (1891); S. 184.

Fagopyrum cynanchoides (Hemsl.) H. Gross in B. G. B. xxiii. 21 (1913).

An herb with slender twining stems, especially distinct from other species of the section because it is softly brown-tomentose: leaves long petiolate; blades suborbicular, bases hastate-cordate, tips abruptly acute or acuminate: flowers in lax racemes or panicles, on slender axillary peduncles.

Central China.

Not seen.

95. **Polygonum Convolvulus** L. Sp. Pl. 364 (1753); H. 53; G. 417; Koid. in Journ. Col. Sc. Tokyo xxvii. Art. 13 p. 49; Mat. 56; Mer. 122; Hultén in Kungl. Sv. Akad. Handl. III. v. No. 2 p. 53 [Fl. Kamtch.].

Fagopyrum Convolvulus (L.) H. Gross in B. G. B. xxiii. 21 (1913).

A prostrate or twining more or less puberulent annual: leaves long-petiolate; blades ovate, tapering to the acuminate tips, bases cordate to sagittate: flowers in axillary or terminal clusters: the three outer perianth segments keeled or rarely narrowly winged: achene triangular, 3–4 mm. long, included in the perianth; surfaces black, finely striate or punctulate.

Eurasia, Africa and North America.

BRITISH INDIA. Northwestern Himalayas: *T. Thomson* (GH).
AFGHANISTAN. *Aitchison 657* (GH).
SIBERIA. Yeniseisk: *Ermolaew* (UC).
CHINA. Shansi: *K. Ling 1860* (UC).
JAPAN. Hokkaido: *Brooks 388* (UC); *Faurie 716* (BS).
PHILIPPINES. Luzon: *Merrill 9698* (GH).

96. **Polygonum dumetorum** L. Sp. Pl. ed. 2. i. 522 (1762); F. & H. 339; G. 418; N. 23; Mat. 57.

Fagopyrum dumetorum (L.) Schreb. Spicil. Fl. Lips. 42 (1771) [not seen]; H. Gross in B. G. B. xxiii. 22.

Tiniaria dumetorum (L.) Opiz. Seznam. 98 (1852).

An herb with twining stems: leaves petiolate; blades broadly cordate, acuminate; perianth broadly winged in fruit, the wings entire or denticulate, extending little, if at all along the pedicels: fruit, including the pedicel, about 1 cm. long: achene triangular, 2–3 mm. long; surfaces black and shining.

Temperate Eurasia and North America.

BRITISH INDIA. Simla: *Duthie 10082* (UC). Kashmir: *R. R. Stewart* (NY) and *4999* (MBG).
CHINA. Shantung: *Zimmermann 581* (BS).
KOREA. *Faurie 559* (BS).
JAPAN. Hokkaido: *Arimoto* (GH, MBG); *Kawase* (MBG). Hondo: *Herb. New York Bot. Gard.*

97. **Polygonum scandens** L. [Sp. Pl. 364 (1753); F. & H. 348; N. 22.] var. **dentato-alatum** (F. Schm.) Maxim. ex Franch. et Sav. Enum. Pl. Jap. ii. 476 (1879); N. 23; Mat. 62.

P. dentato-alatum F. Schm. ex Maxim. in Mém. Acad. Sci. St. Pétersb. ix. 232 [Prim. Fl. Amur.] (1859).

Fagopyrum scandens (L.) H. Gross var. *dentato-alatum* (Maxim.) H. Gross in B. G. B. xxiii. 23 (1913).

An herb with twining stems: leaves petiolate; blades ovate-cordate, acuminate: inflorescences elongated, exceeding the leaves: perianth winged the wings extending towards the bases of the pedicels, usually with dentate margins: fruit, including pedicel, 1.5–2. cm. long: achene triangular, 4 mm. or more in length; surfaces more or less dulled and finely granulose.

Temperate eastern Asia.

BRITISH INDIA. Simla: *Drummond 1921* (UC).
CHINA. Hupeh: *C. F. Li 11204* (NY).
JAPAN. Hokkaido: *Arimoto* (GH, MBG); *Miyabe* (GH). Without Locality: *Faurie 4234* (BS).

98. **Polygonum pterocarpum** Wall. Cat. n. 1690 (1828), nom. nud.; ex Meisn. in W. 62 (1832); H. 54; G. 418.

P. pauciflorum Maxim. Ind. Sem. Hort. Petrop. 1866 p. 3 [not seen].
Bilderdykia pterocarpa (Wall. ex Meisn.) Greene, Leafl. i. 23 (1904).
Fagopyrum pauciflorum (Maxim.) H. Gross in B. G. B. xxiii. 23 (1913).
Tiniaria pauciflora (Maxim.) Nakai in Mori, Enum. Pl. Cor. 136 (1922).

An herb with twining stems: leaves petiolate; blades ovate-cordate, acuminate, not exceeded by the fascicled few-flowered inflorescences: perianth winged in fruit, cuneate-obovate, the wings extending towards the base of the pedicel: fruit, including pedicel, 2 cm. or more long: achene 4–5 mm. long; surfaces finely granulose.

Temperate eastern Asia.

BRITISH INDIA. Sikkim: *Hooker* [*Polygonum 62*] (GH). Kumaon: *Blinkworth* (C, M); *Strachey & Winterbottom 28* (GH). Garhwal: *Strachey & Winterbottom 27* (GH). Northwestern Himalayas: *T. Thomson* (GH). Without Locality: *Meisner Herb.*

According to Palibin (in A. H. P. xviii. 181) *P. pterocarpum* is in part equal to *P. pauciflorum*, but he does not make statements concerning the characters involved. The separation of *P. pauciflorum* from *P. scandens* var. *dentato-alatum* by Franchet & Savatier (Enum. Pl. Jap. ii. 480) ("Racemi axillares, foliis breviores, oliganthi, pedunculo communi saepius brevissimo et tunc flores quasi fasciculati = *P. pauciflorum*") would apply equally well to *P. pterocarpum*.

99. **Polygonum baldschuanicum** Regel in Act. Hort. Petrop. viii. 684 t. x. (1883); Sarg. Pl. Wils. iii. 325.

A glabrous woody twining vine: leaves slenderly petiolate, clustered at the base of shoots branching from the main axes; blades ovate, up to 8 cm. long, bases more or less cordate and sometimes sagittate, tips mucronate, sometimes ocreae short-cylindric, eciliate: inflorescence of branching panicles 6–15 cm. long terminating the branches, entirely glabrous: fascicles several-flowered: flowers on pedicels 5–12 mm. long, winged and tapering to a slender base: perianth winged, 5–8 mm. broad in fruit and enclosing the triangular smooth achene which is about 5 mm. long.

CENTRAL ASIA. Turkestan: *Zabel 1*, *3* and *4* (AA).

The specimens cited above were grown in the "Botanischer Garten der Forstakademie, Muenden, Hannover" from material collected by Regel in 1883 and 1887. There are several "cultivated" specimens of the species in the herbarium of the Arnold Arboretum.

100. **Polygonum Auberti** L. Henry in Rev. Hort. 1907. p. 82 f. 23 & 24; Sarg. Pl. Wils. iii. 325; S. 184.

A plant in habit much like *P. baldschuanicum*, but with leaf blades variable, often truncate at the base, rounded at the tip and usually with wavy or crispate margins: axes of the inflorescence and ocreolae puberulent: pedicels 5–8 mm. long: perianth 4–5 mm. broad: achene about 4 mm. long.

Temperate eastern Asia.

CHINA. Tibet: *Rehder* (AA—2 sheets, Hort. Lemoine, seeds from Tibet). Yunnan: *Rock 5152* (UC). Szechuan: *W. P. Fang 3681* (NY). Kansu: *R. C. Ching 375* (UC)?; *Rock 12757* (UC, AA). Shensi: *Hers 3043* (AA). Honan: *Hers 813* (AA).

Some difficulty has been experienced in separating specimens of this species from *P. multiflorum*. Possibly the extremes may be found to mix in such a manner that it will be best to consider this a variety of that species.

101. **Polygonum multiflorum** Thunb. Fl. Jap. 169 (1784); C. 40; Mat. 59; Sarg. Pl. Wils. iii. 325; S. 184.

"*P. chinense* L." Houtt. Nat. Hist. viii. 479 t. 49 f. 3 (1777)—acc. to M. 64 & in DC. 136 where attributed to Houtt.

Helxine multiflorum (Thunb.) Rafin. Fl. Tellur. iii. 10 (1836).

Pleuropterus cordatus Turcz. in Bul. Soc. Nat. Mosc. xxi. Pt. 1, p. 587 (1848)—acc. to M. in DC. 136.

P. Convolvulus Thunb. ex Mat. 59 (1912), in syn.

Pleuropterus multiflorus Turcz. ex Nakai in Fed. Rep. xiii. 267 (1914) = *P. multiflorum*.

A nearly glabrous plant with twining herbaceous branches from a woody tuberous rhizome: stems sometimes woody at the base: leaves slenderly petiolate, not usually clustered; blades ovate with cordate base and acuminate tips, 3–7 cm. long: inflorescence of profusely flowered branching panicles; axes and ocreolae puberulent: flowers small, 2–3 mm. broad and becoming 5–6 mm. broad in fruit, tapering to a slender base and enclosing at maturity the triangular shining achenes 2–3 mm. long.

Temperate and subtropical eastern Asia.

CHINA. Yunnan: *Ducloux 485* (BS); *Forrest 11960?* (UC, AA); *Henry 9751?* (US), *9751-A* (AA, NY—2 sheets); *E. E. Maire 165* (UC, BS), *166* (BS), *7368-B* (BS—2 sheets); *Rock 6965* (UC). West China: *E. H. Wilson 1419* (NY). Hupeh: *Henry 82, 2343* and *2488* (GH); *E. H. Wilson 437* (GH, AA). Anhwei: *R. C. Ching 4642* (GH, UC). Kiangsu: *Herb. U. Nanking 225* (UC, MBG, BS). Chekiang: *R. C. Ching 3631* (UC); *H. H. Hu 1460* (BS). Fukien: *Herb. Fukien Chr. U. 2867* and *5664* (UC). Kwangtung: *Levine* [*CCC 1773* and *3437*] (GH, MBG, BS); *To* [*CCC 3623*] (BS); *Tsang & Wong 3107* (UC); *Y. Tsiang 1370* (UC).

JAPAN. Hondo: *Maximowicz*—fr. from Kiusiu (GH, AA, T—2 sheets); *Watanabe* (GH). Kiusiu: *Oldham 700* (GH, T). Without Locality: *Herb. Lugd.-Bat.* (GH, M), *7* (C), *179* (NY).

FORMOSA. *Faurie 762* and *1503* (BS); *Henry* (NY), *63* (MBG—2 sheets), *2026* (NY); *Kawakami 130* (BS); *Nakahara 482* (BS); *Oldham 436* (GH); *Sasaki 738* (UC).
FARTHER INDIA. INDO-CHINA: *Petelot 1171-A* (UC).

101a. **Polygonum multiflorum** Thunb. var. **ciliinerve** (Nakai) comb. nov.

Pleuropterus ciliinervis Nakai in Fed. Rep. xiii. 267 (1914).

Plant resembling *P. multiflorum* but with larger more elongated leaf blades which are glandular-ciliate on the nerves beneath: stems more erect and with less tendency to be prostrate and twining.

Temperate eastern Asia.

CHINA. MANCHURIA: *Komarov 563* (GH). SZECHUAN: *E. H. Wilson 3183* (US and AA—2 sheets each), *3185* (GH, US).
KOREA. *E. H. Wilson 9112* (MBG, US—2 sheets, AA).

102. **Polygonum sachalinense** F. Schm. ex Maxim. in Mém. Acad. Sci. St. Pétersb. ix. 233 [Prim. Fl. Amur.] (1859); Mat. 61.

Reynoutria sachalinensis (F. Schm. ex Maxim.) Nakai, Veg. Dagelet Is. 18 (1919).

An erect coarse glabrous or puberulent herb, strongly stoloniferous: stems 2–4 m. tall: leaves petiolate; blades oval to oblong, 10–30 cm. long, bases shallowly cordate or sometimes the upper ones truncate; the veins elevated beneath: flowers numerous, in axillary panicles, about 2 mm. across: small axes of the panicles puberulent, the larger ones usually fusco-tomentose: pedicels winged, tapering to a capillary base: perianth winged at maturity, 4–5 mm. broad, enclosing the triangular achenes.

Coast and islands of temperate eastern Asia.

SIBERIA. SAKHALIN: *Brylkin* (GH).
JAPAN. HOKKAIDO: *Arimoto* (GH—2 sheets, MBG); *Brooks 387* (UC); *Maximowicz* (GH); *Y. Takenobi* (GH). HONDO: *Iishiba* (UC); *Yokohama Nursery* (OA—2 sheets).
WITHOUT LOCALITY: *Herb. Hort. Bot. Petrop.* (GH).

103. **Polygonum cuspidatum** Sieb. et Zucc. Fl. Jap. Fam. Nat. Pt. 2, p. 84 (n. 731) (1846); F. & H. 336; N. 24; Hay. in Journ. Coll. Sci. Tokyo xxv. Art. 19. 185 [Fl. Mont. Form.]; Mat. 56; S. 185.

Reynoutria japonica Houtt. Handl. Regn. Veg. viii. 639 t. 51 f. 1 (1777)—acc. to Mak. in B. M. T. xv. 84. *P. cuspidatum* is given as a syn.
P. Sieboldi hort. nonull. ex Meisn. in DC. 136 (1856), in syn., not of Meisn.
P. compactum Hook. f. Bot. Mag. t. 6476 (1880).
P. Forbesii Hance in Journ. Bot. xxi. 100 (1883).

P. Zuccarinii Small in Mem. Bot. Col. Coll. i. 158 t. 66 (1895) [Monogr. Polygon.]. *P. cuspidatum* is given as a syn.

P. multiflorum Sieb. & Buerg. ex Mak. l. c. (1901); in syn. = *P. Reynoutria.*

P. Reynoutria Mak. l. c. (1901). *P. cuspidatum* is given as a syn.

P. Sieboldii De Vriese acc. to Bailey, Cyclop. Am. Hort. 1393 f. 1880 (1901). *P. cuspidatum* is given as a syn.

Pleuropterus Zuccarinii (Small) Small in Br. & Br. Ill. Fl. ed. 2. i. 676 f. 1655 (1913).

Reynoutria elata Nakai in Cat. Sem. Hort. Tokyo 1914 p. 12, nom. nud.; 1920 p. 35, in syn. = *R. japonica* Houtt. var. *elata* Nakai.

Pleuropterus cuspidatus (Sieb. et Zucc.) H. Gross in Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 114 (1919).

Reynoutria Henryi Nakai in Sasaki, List Pl. Form. 171 (1928), nom. nud.

A glabrous bushy herb up to 2 m. tall: stems often spotted or streaked with red or purple: leaves petiolate; blades ovate to orbicular, often acuminate, 5–10 cm. long, bases rounded, truncate or cuneate, margins entire or irregularly sinuate: ocreae short, caducous: inflorescence of axillary rather densely flowered panicles 3–8 cm. long: flowers small, dioecious, white, on slender pedicels which are winged above: perianth winged about 4.5–6 mm. broad in fruit: achene triangular, shining, about 4 mm. long.

Japan and China.

CHINA. YUNNAN: *Ducloux 539* (GH, UC); *Forrest 8470* (GH); *Maire 31* and *356* (UC), *485/1914* (BS), *545* and *1226* (UC), *3939* and *3997* (GH, UC), *3997-B* (GH, UC, BS). HONAN: *Hers 454* (AA). HUPEH: *Y. Chen 666* (UC); *S. S. Chien 5105* and *5258* (UC); *Henry, 14, 2290* and *4962* (GH); *A. N. Steward 1684* (UC). ANHWEI: *R. C. Ching 4152* (UC, US), *4508* (GH, UC, US); *Y. L. Keng 1715* and *1932* (UC). KIANGSU: *R. C. Ching 4862* (UC); *K. Ling 2308* (GH—2 sheets), UC; *Merrill 11409* (BS); *Herb. U. Nanking 1558* (BS), *1586* (UC, US, BS). CHEKIANG: *Allison 60* (GH); *Cheo & Wilson 84* (GH, UC); *R. C. Ching 3750, 5016* and *5158* (UC); *H. H. Hu 1511* (UC); *Y. L. Keng 638* (UC). FUKIEN: *R. C. Ching 2293* (GH, UC, US); *H. H. Chung 2195* (AA), *2304* and *3042* (GH, UC); *Herb. Fukien Chr. U. 1135* and *3142* (UC); *Metcalf & Chang 535* and *536* (UC). KIANGSI: *H. H. Chung 583* (BS); *H. H. Hu 1294* (BS); *A. N. Steward 580* (UC, MBG, BS). KWANGTUNG: *Y. Tsiang 1290* (UC, AA).

KOREA. *Taquet 3140* and *3141* (AA).

JAPAN. HOKKAIDO: *Maximowicz* (GH). HONDO: *Arimoto* (GH, MBG); *Iishiba* (UC—2 sheets); *Kariyone* (UC); *Maries* (GH); *Savatier 1036* (US); *United States Nat. Herb. 1396935; Watanabe* (OA—2 sheets). SHIKOKU: *Watanabe* (OA). KIUSIU: *Oldham 699* (GH). LOCALITY?: "Hakone o-wakidam" *Sawada* (UC). WITHOUT LOCALITY: *Bärger* (MBG); *Herb. Lugd.-Bat.* (GH); *Siebold* (MBG).

FORMOSA. *Bartlett 6030* (UC, US), *6191* (US); *Kanehira & Sasaki 21699* (UC); *Nakahara* (US).

Forbes & Hemsley (op. cit. 337) "do not find any character by which they (*P. compactum* & *P. cuspidatum*) may be distinguished from each other, except perhaps the shape of the fruit." Though Hance states that *P. Forbesii* is "very distinct by the form of its leaves," Forbes & Hemsley (op. cit. 339) "find no character to separate this from the variable *P. cuspidatum*."

Dr. Bailey, l. c., has referred to the bibliography accompanying Bot. Mag. t. 6503 as the basis for his use of "*P. Sieboldii* De Vriese." This bibliography appears to be a literal copy of that given by Meisner in DC. Prodr. xiv. 136, and is as follows: "*P. Sieboldi* hort. nonull. De Vriese in Nederl. Kruidkund. Archief. 2, p. 254* et in Jaarb. d. Koninkl. Nederl. Maatschap. van Tuinb. te Leyden 1850, cum. ic. Flora 1851, p. 523. Lindl. et Paxt. Mag. 1, p. 137 cum fig. Paxt. Fl. Gard. 1852, 1, p. 137, fig. 90." The meaning of the * following the first reference is not clear. All these references are to the cultivated form of *P. cuspidatum* Sieb. & Zucc. The name *P. Sieboldi* occurs only in the second of these, a photograph of which has been seen through the kindness of Dr. Bailey, and here it is given as a synonym in a bibliography which is in full as follows:

"*Polygonum cuspidatum* Sieb. & Zucc. Fl. Jap. fam. nat. in Act. Monoc. IV. Bd. 1844–1846. p. 208.

" *pictum* Sieb. Cat. des pl. du Japon, cf. Jaarboek der Konikl. Nederl. Maatsch. tot Aanm. van den Tuinbouw 1848. p. 44.

" *Sieboldi* Rwdt. in Mss."[1]

The name *P. cuspidatum* Willd. because of which *P. cuspidatum* Sieb. & Zucc. is displaced by Small, l. c., and by Bailey, l. c., occurs, so far as is known to the writer, only as an herbarium name given by Sprengel (Syst. ii. 256) as a synonym for *P. acuminatum* Kunth. The use of the name *P. Sieboldi* hort. by Meisner as a synonym for *P. cuspidatum* Sieb. & Zucc. is preceded (p. 133) by the regular use of *P. Sieboldi* Meisn. for a plant of § *Echinocaulon*. There does not, then, appear to be sufficient reason for displacing Siebold & Zuccarini's name under either the International Rules of Botanical Nomenclature or the American Code.

The writer is aware that the practice of a number of botanists has been to consider a name non-valid for later use if it has previously occurred in print, regardless of whether or not such occurrence was in such form as to be considered proper publication. This procedure may be illustrated by three examples from the literature pertaining to the genus *Polygonum* which are cited below:

[1] De Vriese in Jaarb. Konink. Nederl. Maats. Aanmoed. Tuinb. 1849, p. 31 (1850).

1. "**Polygonum Zuccarinii** Small.
   Polygonum cuspidatum Siebold & Zuccarini, Fl. Japon. Fam. Nat. **2:** 84 (1846), not Willd." Small, l. c.
2. "**POLYGONUM Sieboldii,** De Vriese (*P. cuspidatum,* Sieb. & Zucc., not Willd. *P. Zuccarinii,* Small)." Bailey, l. c.
3. "**Polygonum Portoricense** Bertero.

   . . . . . .

   Polygonum densiflorum Meisner in Mart. Fl. Bras. **5:** 13 (1855), not Blume; . . .
   Polygonum Portoricense Bertero; Meisn. in DC. Prodr. 14: 121 (1856), as synonym." Small, op. cit. 46.

In the first two examples *P. cuspidatum* Sieb. & Zucc. is thrown down because of Willdenow's herbarium name given in synonomy by Sprengel. In the third example *P. densiflorum* Meisn. is displaced by *P. portoricense,* an herbarium name which Meisner gave as a synonym. Weatherby has pointed out (Rhodora xxv. 20) that *P. densiflorum* Blume began with an error in Index Kewensis, apparently based on Blume's *P. corymbosum* var. *densiflorum* (Bijdr. 534).

Neither the International Rules nor the American Code gives support to such procedures, for (1) Article 50 of the International Rules states that a name shall not be rejected "because of the existence of an earlier homonym which is universally regarded as non-valid" (p. 48) and Article 37 states that "Citation in synonymy or incidental mention of a name is not effective publication." (p. 43). (2) Although Canon 16 of the American Code states that "A name is rejected when preoccupied (homonym). (a) A specific name is a homonym when it has been published for another species under the same generic name."[1] it is nevertheless true that the names used in the cases cited above cannot be considered as homonyms under Canon 16 because Canon 12 states that "A name is not published by its citation in synonymy or by incidental mention." (l. c. 171) and neither *P. acuminatum* Willd. nor *P. densiflorum* Blume have, then, been "published."

Section 7. ACONOGONON Meisn., Prodr. Polygon. 43, 55 (1826).

Key to Species.

a. Inflorescence in rather dense head-like panicles: leaf-blades orbicular, cordate to ovate-oblong. . . . *b*
b. Leaf blades ovate-oblong. . . . . 104. *P. tibeticum.*
b. Leaf blades orbicular, truncate or cordate at the base. . . . *c*
c. Small plant growing in matted tufts: leaf-bases not cordate, up to 5 mm. in diameter: stamens 5 . . 105. *P. nummularifolium.*
c. Plant stoloniferous, with numerous erect shoots: leaf-blades often cordate at the base, up to 4 cm. in diameter . . . . . 106. *P. Forrestii.*

[1] Bull. Torr. Bot. Club xxxiv. 174.

a. Inflorescence in more or less scattered or open panicles, often pyramidal: leaf-blades linear, lanceolate or ovate....*d*
d. Achenes 3-winged at the angles, enlarged and somewhat membranous....*e*
e. Pedicels winged above, tapering to a slender base: perianth 1.5–3 mm. long....*f*
f. Leaves sessile or short-petiolate; blades lanceolate, 4–8 cm. long: plant sparsely branching, 2–4 dm. tall, glabrous or nearly so.....107. *P. tripterocarpum.*
f. Leaves petiolate; blades ovate, acuminate, up to 2 dm. long, usually tomentose beneath: stems branched, usually pubescent.....108. ***P. Weyrichii.***
e. Pedicels not winged: perianth 3–4 mm. long....109. *P. campanulatum.*
d. Achenes not winged....*g*
g. Perianth accrescent and usually baccate in fruit.110. *P. paniculatum.*
g. Perianth unaltered in fruit....*h*
h. Perianth 3–4 mm. long (smaller in some forms of *P. angustifolium*)....*i*
i. Achenes protruding from the calyx in fruit: leaf-blades rather blunt-tipped, glabrous or puberulent ....*j*
j. Ocreolae minute: flowers few.....111. *P. pinetorum.*
j. Ocreolae ovate 2–3 mm. long: flowers profuse....*k*
k. Achene rotund, apiculate.....112. ***P. Komarovii.***
k. Achene 3-angled: leaf-blade linear to lanceolate 113. *P. angustifolium.*
i. Achene about equal to the perianth: leaf-blades ovate or ovate-cordate, obtuse or subacute.114. *P. rumicifolium.*
i. Achene shorter than the calyx: leaf-blades acute to acuminate, pubescent or tomentose beneath.115. *P. polystachyum.*
h. Perianth 1.5–3 mm. long....*l.*
l. Inflorescence irregular or flat-topped: plants dichotomously branched....*m*
m. Spikes of the inflorescence densely flowered, subtended by broad leaf-like bracts: stout and erect: leaf-blades oblong, elliptic or ovate....*n*
n. Plant shrubby.....116. *P. tortuosum.*
n. Plants herbaceous....*o*
o. Leaf-blades pubescent and with undulate margins.....117. *P. perigrinatoris.*
o. Plant entirely glabrous: margins of the leaf-blades entire.....118. *P. Chaneyi.*
m. Spikes slender, not so crowded, subtended by narrowly lanceolate bracts: branches slender: leaves lanceolate to linear, tapering at the base to a short petiole.....119. *P. divaricatum.*
l. Inflorescence pyramidal: plant not dichotomously branched....*p*
p. Plant glabrous, coriaceous and fleshy: leaf-blades linear to lanceolate: ocreolae connate, truncate 120. *P. sibiricum.*
p. Plants softly pubescent, not fleshy: leaf-blades oblong-lanceolate or spathulate....*q*
q. Plant more or less pubescent: leaf-blades often narrowly spathulate: ocreolae minute, lanceolate-acuminate; flowers dark red, perianth glabrous.....121. *P. Hookeri.*
q. Plant, including perianth, sericeous: leaf-blades oblong-lanceolate.....122. *P. sericeum.*

104. **Polygonum tibeticum** Hemsl. in Hook. Icon. Pl. xxv. t. 2471 (1896).

A low sparsely branching glabrous shrub: stems up to 4 dm. high: leaves short-petiolate; blades ovate to oblong, coriaceous, 2–4 cm. long: inflorescence in short-pedunculate terminal cymes: perianth 5-cleft: stamens 8, borne on the perianth and alternating with the lobes of a basal disc.

Central Tibet.

Not seen.

105. **Polygonum nummularifolium** Meisn. in DC. 127 (1856); H. 53; G. 417; S. 184.

P. Forrestii Diels var. *pumilio* Lingelsh. acc. to S. l. c. (1929).

Very small tufted stoloniferous perennial: leaves petiolate; blades orbicular, 3–5 mm. in diameter: inflorescense of rather dense many-flowered clusters; perianth 1–2 mm. long; stamens 5 (according to Hooker): achenes biconvex.

Alpine regions in the Himalayas.

BRITISH INDIA. Sikkim: *Hooker* (GH, M). Kumaon: *Strachey & Winterbottom 43* (GH, M).

Meisner placed this species in § *Aconogonon* because "the flowers are not capitate, and the minute styles are quite free."

106. **Polygonum Forrestii** Diels in Not. Bot. Gard. Edinb. v. 258 (1912); S. 184.

A stoloniferous perennial with erect branches 5–20 cm. tall: leaves, especially the basal ones, long-petiolate: blades elliptic to orbicular, silvery-pubescent, 1–4 cm. in diameter, often, together with petioles and stems, tinged red: flowers in terminal cymes, abundant; perianth cream-colored to white, 4–5 mm. long, unequally 4–5 lobed; stamens 6–8, with purplish anthers; styles 3.

Yunnan Province, China.

CHINA. Yunnan: *Forrest 6275* (UC), *10456* (GH, UC—2 sheets), *19908* (US); *Rock 4704* (UC, US), *5015* (US, NY), *6360* (GH, US), *9697* (UC, US); *Schneider 2144* and *3051* (GH, US).

This species has a habit similar to *Oxyria*, but appears to be closely related to *P. nummularifolium*.

107. **Polygonum tripterocarpum** A. Gray in Rothrock in Ann. Rep. Smiths. Inst. 1867, p. 453 (1868).

P. Pavlowskianum Glehn in A. H. P. iv. 77 (1876).

Pleuropteropyrum Pavlowskianum (Glehn) H. Gross in B. G. B. xxiii. 9 (1913).

Pleuropteropyrum tripterocarpum (A. Gray) H. Gross l. c. (1913).

An erect herb with simple or sparsely branched stem, glabrous or sparsely pubescent at the nodes: leaves subsessile (the lower ones reduced to the ocreae), lanceolate, 3–7 cm. long: inflorescence leaf-bearing, of axillary many-flowered panicles: ocreolae 1–2-flowered: flowers exserted on slender pedicels: perianth 2.5–3 mm. long: achene broadly 3-winged, about 6 mm. long.

Subarctic eastern Siberia.

SIBERIA. Ochotsk: *Buxton* (NY—3 sheets); *Wright* (GH, T). East Cape: *Dall* (US); *Wright* (GH, US).

Gross, l. c., suggests the possible identity of *P. Pawlowskianum* and *P. tripterocarpum* and the descriptions seem to justify this opinion.

108. **Polygonum Weyrichii** Fr. Schm. ex Maxim. in Mém. Acad. Sci. St. Pétersb. ix. 234 [Prim. Fl. Amur.] (1859); Kudo in Journ. Col. Agric. Tokyo xii. 33.

Pleuropteropyrum Weyrichii (F. Schm.) H. Gross in B. G. B. xxiii. 9 (1913).

A coarse erect herb with sparsely branching stems 1 m. or more tall: leaves petiolate; blades ovate, acuminate, densely pubescent beneath, 10–20 cm. long: inflorescence of axillary or terminal panicles which flower profusely: perianth 1.5–2. mm. long: achenes broadly 3–winged, about 6 mm. long.

Northeastern Asia and Japan.

SIBERIA. Sakhalin: *Glehn* (GH, C); *Regel 73* (GH).
JAPAN. Hokkaido: *Arimoto* (GH, MBG); *Hogg* (C); *Maximowicz* (GH); *Miyabe* (GH, AA). Hondo: *United States Nat. Herb. 350896* and *1396931*.

108a. **Polygonum Weyrichii** F. Schm. var. **alpinum** Maxim. ex Franch. et Savat. Enum. Pl. Jap. 1. 402 (1875), nom. nud., and in Mél. Biol. ix. 617 (1876); Mat. 64; Kudo in Journ. Col. Agric. Sapporo xii. l. 33.

P. paniculatum Franch. et Savat. Enum. Pl. Jap. ii. 477 (1879), not of Blume = *P. Savatieri* acc. to Nakai in B. M. T. xxiii. 414.

P. Savatieri Nakai, l. c. (1909). *P. Weyrichii* var. *alpinum* is given as a syn.

Pleuropteropyrum alpinum (Maxim.) Koid. in B. M. T. xxx. 78 (1916).

This variety differs from the typical form in having the leaf blades glabrous or glabrescent beneath and not at all tomentose.

SIBERIA. Kamtchatka: *Seeman* (GH).
CHINA. Sungaria: *Schrenk* (GH).
JAPAN. Kurile Islands: *Miyabe* (GH). Hondo: *Arimoto* (MBG); *Tchonoski* (GH, US, T); *United States Nat. Herb. 44490* and *1396953; Watanabe* (GH). Locality?: *Faurie 712* (BS).
FORMOSA. *Oldham 434* (GH).

109. **Polygonum campanulatum** Hook. f. Fl. Br. Ind. v. 51 (1886); G. 416; S. 183.

A slender-stemmed herb, creeping and stoloniferous at the base: leaves petiolate; blades ovate to lanceolate, caudate or acuminate, sparsely pubescent on both surfaces, 3–10 cm. long: ocreae rather loosely tubular, up to 12 mm. long: flowers in nodding or drooping cymes, borne on pubescent axes; perianth pink or white, 3–4 mm. long, campanulate, obtusely lobed: achene pale, winged, exserted from the perianth at maturity.

The Himalayas.

BRITISH INDIA. Sikkim: *Clarke 9696-B* (C), *25874-A* (US); *Hooker* and *71* (GH).

Hooker included var. *fulvidum* and two others in his description of *P. campanulatum*. The writer has followed Gage in separating var. *fulvidum*, limiting the description of the typical form of the species accordingly.

109a. **Polygonum campanulatum** Hook. f. var. **fulvidum** Hook. f. Fl. Br. Ind. v. 52; G. 416.

"*P. alpinum* All." var. *sinicum* Dammer in Engl. Bot. Jahrb. xxix. 314 (1900) [Diels, Fl. Cent.-China]—acc. to S. 183 = *P. campanulatum*.

P. Duclouxii Lévl. et Van. in Fed. Rep. vi. 112 [211] (1908)—acc. to S. l. c. = *P. campanulatum*.

Persicaria Duclouxii (Lévl. et Van.) H. Gross in B. G. B. xxiii. 32 (1913).

In this variety, in addition to being sparsely pubescent, the leaf-blades are covered beneath "with dense matted fulvous tomentum."

The Himalayas to western China.

BRITISH INDIA. Bengal: *Clarke 27506-A* (US). Sikkim: *Clarke 13579-A* (US); *Hooker 69* (GH). Kumaon: *Strachey & Winterbottom 35* (GH).

CHINA. Tibet: *Cave* (BS). Yunnan: *Ducloux 540* (GH, UC); *Henry 9454* (NY—2 sheets), *9454-A* (US); *E. E. Maire 113/1914* (BS), *7493* (UC), *7493-B* (GH, UC, US, BS); *Rock 4904* (US, NY), *6265* (GH, UC, US); *Schneider 2118* (GH, US). Szechuan: *W. P. Fang 2850* (NY); *E. H. Wilson 3184* (GH, US).

The var. *sinicum* of Dammer and the species *Duclouxii* are both given by Samuelsson as synonyms of *P. campanulatum*. The descriptions indicate that both have the tomentose character of var. *fulvidum*.

109b. **Polygonum campanulatum** Hook. f. var. **lichiangense** (W. W. Sm.) comb. nov.

P. lichiangense W. W. Sm. in Not. Bot. Gard. Edinb. viii. 197 (1914); S. 183.

A variety distinguished by having the leaf-blades densely grey-tomentose beneath and by having the pubescence of the upper surfaces of the leaf-blades set in basal glands. The ocreae are coarsely brown-strigose.

Yunnan Province, China.

CHINA. YUNNAN: *Rock 4930* (GH, US), *5647* (UC, US), *11677* (US, NY); *Schneider 2007* (GH), *2183* (GH, US).

P. lichiangense is distinguished from *P. polystachyum* by having setose ocreae and leaves densely cinereo-tomentose beneath. These characters seem to place the plant very close to *P. campanulatum* var. *fulvidum*.

110. **Polygonum paniculatum** Blume, Bijdr. 533 (1825); H. 49; G. 414; Dan. 233.

Coccoloba Totnea D. Don, 74 (1825)—acc. to Dan. l. c.

P. molle D. Don, 72 (1825)—acc. to Dan. l. c.

P. polyanthos de Bruyn in Miq. Pl. Jungh. 304 (1854)—acc. to Dan. l. c.

P. baccatum Reinw. ex Meisn. in Miq. 64 (1865), in syn.

Persicaria mollis (D. Don) H. Gross in B. G. B. xxiii. 31 (1913).

A shrub 1–3 m. tall, silky-pubescent to glabrescent: leaves petiolate; blades elliptic, ovate or broadly lanceolate, acuminate, 5–20 cm. long: inflorescence an openly flowered terminal thyrsoid panicle the lower branches of which develop from the axils of the upper leaves: flowers very numerous; perianth white, 1.5–2 mm. long, accrescent and sometimes baccate in fruit: achene triangular, about 3 mm. long, enclosed by the enlarged coriaceous or fleshy perianth.

Subtropical eastern Asia to the East Indies.

BRITISH INDIA. SIKKIM: *Hooker* (GH—2 sheets, M). EASTERN HIMALAYA: *Griffith 4128* (GH). NEPAL: *De Silva* (M); *Wallich* (C, M).

CHINA. YUNNAN: *Forrest 8735* (GH); *Rock 7030* (GH, UC, US); *K. K. Tsoong 2280* (BS).

EAST INDIES. SUMATRA: *Bunnemeyer 984* and *2779* (BS), *9459* (UC); *Korthals 133* and *150* (M); *Yates 1497* and *2467* (UC). JAVA: *Arsin 19681* (UC); *Herb. Lugd.-Bat.* (GH), *39*, *76* and 83 (M), *95* (C); *Sapūm 2471* (UC); *de Vriese* (C), *98* (M); *Yates 2838* (UC).

Danser, l. c., has chosen to use Blume's name *P. paniculatum* instead of Don's *P. molle* of the same date because the last named species represented only flowering material, the fruiting specimens being described by Don as *Coccoloba Totnea*. *P. paniculatum* is described by Meisner, op. cit. 65, as merely a glabrous variety of *P. molle*.

110a. **Polygonum paniculatum** Blume var. **frondosum** (Meisn.) comb. nov.

P. frondosum Meisn. in DC. 137 (1856).

P. Hayei Strach. & Winter. ex. Meisn. in DC. l. c. (1856), in syn. = *P. frondosum.*

This variety is distinguished by being perfectly glabrous in all its parts and by having leaf blades broader and firmer in texture than in the typical form of the species.

The Western Himalayas.

BRITISH INDIA. KUMAON: *Strachey & Winterbottom 34* (GH, M).

Hooker (p. 50) describes *P. frondosum* as "A very distinct species, perfectly glabrous in all its parts, easily distinguished by its very broad leaves;" while Gage (p. 415) says "This species is exceedingly like *P. paniculatum*, from which in the dry state it can only be distinguished by the glabrous margins of its leaves."

110b. **Polygonum paniculatum** Blume var. **rude** (Meisn.) comb. nov.

P. rude Meisn. in DC. 137 (1856); S. 183.

P. Esquirolii Lévl. in Fed. Rep. viii. 171 (1910)—acc. to S. 183 = *P. rude.*

Persicaria rudis (Meisn.) H. Gross in B. G. B. xxiii. 31 (1913).

P. tsangschanicum Lingelsh. & Borza in Fed. Rep. xiii 385 (1914)—acc. to S. l. c. = *P. rude.*

This variety is characterized by being retrorsely adpressed hirsute on the stems, especially below the nodes, on the petioles and the under surface of the leaf blades along the midveins: plants sometimes nearly glabrous, but always with a few retrorse hairs below the nodes.

Southeastern Asia.

BRITISH INDIA. ASSAM: *Clarke 44817-C* (C); *Griffith* (M); *Hooker & Thomson* (GH, BS); *Mann* (US). EASTERN HIMALAYAS: *Griffith 4128* (T).

CHINA. YUNNAN: *Forrest 1060* (AA), *8583* (GH); *Henry 9283* (US, AA—2 sheets), *12519* (AA); *Rock 6375* and *6596* (US), *6857* (UC, US, NY); *Schneider 2520, 2595* and *2725* (GH), *2761* (GH, US).

FARTHER INDIA. INDO-CHINA: *Petelot 1604* (UC).

P. rude is described by Meisner, l. c., as very near to *P. molle* and is separated only by vegetative characters. There are nearly glabrous specimens approaching the typical form of *P. paniculatum* or the var. *frondosum.*

111. **Polygonum pinetorum** Hemsl. in Journ. Linn. Soc. xxvi. 345 (1891).

Persicaria pinetorum (Hemsl.) H. Gross in B. G. B. xxiii. 30 (1913).

P. gloriosum Lévl. in Fed. Rep. xiii. 338 (1914), acc. to Samuelsson.[1]

[1] Samuelsson according to letter from Dr. W. W. Smith.

A perennial glabrescent herb .5–1.3 m. tall, similar in habit to *P. campanulatum:* flowers in lax glabrous panicles, few and on slender pedicels: ocreolae minute: perianth 5-cleft: stamens 8: styles 3.

Hupeh Province, China.

Not seen.

Dammer[1] has placed this species in § *Echinocaulon.*

112. **Polygonum Komarovii** Lévl. in Fed. Rep. viii. 171 (1910).

A stout erect herb with habit similar to *P. angustifolium;* but distinguished by having rotund apiculate 2-styled achenes.

Sakhalin Island, Siberia.

Not seen.

113. **Polygonum angustifolium** Pall. Reise iii. 230, 320 (1776).

P. undulatum Murr. in Comm. Götting. v. 34, t. v. (1774), not of Bergius = *P. polymorphum* var. *undulatum*—acc. to Led. 525.

P. sibiricum L. f. Suppl. 228 (1781) = *P. polymorphum* var. *alpinum* acc. to Led. l. c.

P. alpinum All. Fl. Pedem. ii. 206 t. 68 f. l. (1785), acc. to Led. 524 = *P. polymorphum* var. *alpinum.*

"*P. divaricatum* L." Vill. Hist. Pl. Dauph. iii. 522 (1789). *P. alpinum* is given as a syn.

P. salignum Willd. Enum. Hort. Berol. 430 (1809) = *P. polymorphum* var. *salignum* acc. to Led. l. c.

P. crispum Hornem. Hort. Hafn. 962 (1813) = *P. polymorphum* var. *salignum* acc. to M. in DC. 140.

P. acidum Pall. Reise ii. 93 (1773), nom. nud.; Spreng. Syst. ii. 255 (1825), in syn. = *P. undulatum* Murr.; Led. 525 = *P. polymorphum* var. *alpinum.*

P. ciliatum Willd. ex Spreng. l. c. (1825), in syn. = *P. undulatum* Murr.

Gononeus undulatus Rafin. Fl. Tellur. iii. 17 (1836)?? = *P. alpinum* acc. to Ind. Kew.

P. polymorphum Ledeb. 524 (1846–51), excl. vars. *soongoricum* and *diffusum. P. angustifolium* Pall. is given as a syn.

P. latifolium Kotschy ex Boiss. Fl. Orient. iv. 1032 (1879), in syn. = *P. alpinum* var. *latifolium.*

Persicaria alpina (All.) H. Gross in B. G. B. xxiii. 31 (1913).

Persicaria undulata (Murr.) H. Gross in Loesen. in Beih. Centralbl. xxxvii. Pt. 2, p. 114 (1919).

Aconopogon polymorphum (Ledeb.) Nakai in Mori, Enum. Pl. Cor. 129 (1922).

[1] Dammer in Engl. Bot. Jahrb. xxix. 314 [Diels, Fl. Cent.-China].

Polygonum frigidum Kudo in Journ. Coll. Agric. Sapporo xii. 33 (1923) = *P. polymorphum* var. *frigidum*.

An erect branching herb: leaves petiolate; blades linear-lanceolate to oblong or ovate, glabrous or softly pubescent, margins smooth or undulate: flowers in dense terminal pyramidal panicles: perianth deeply cleft, 3–4 mm. long: achene triangular, exceeding the somewhat accrescent perianth in fruit; surfaces smooth, concave.

Temperate and subarctic regions of Asia and North America.

BRITISH INDIA. KASHMIR: *Gammie* (UC); *R. R. Stewart & 4100½* (NY). WESTERN HIMALAYA: *Schlagintweit 3083* (US), *3147* and *3566* (GH). NORTHWESTERN HIMALAYA: *T. Thomson* (GH, M).

CENTRAL ASIA. *Regel* (C).

SIBERIA. TOMSK: *Herb. M. B. G. 124621*. SAMOYEDEN: *Brenner* (US). YENISEISK: *Ermolaew* (UC). IRKUTSK: *Karo* (MBG—2 sheets); *Krystofovic* (UC—2 sheets). TRANSBAICALIA: *Karo 213a* and *213b* (MBG—2 sheets each). AMUR: *Karo 312* (BS); *Maack 211c* (GH). YAKUTSK: *Augustinowicz* (MBG). OCHOTSK SEA: *Wright* (GH, US). WITHOUT LOCALITY: *Herb. Columbia U.*

CHINA. TIBET: *Schlagintweit 865* (US—2 sheets), *6741* (M). SUNGARIA: *Schrenk* (GH). MONGOLIA: *Chaney 480* (UC). SHANSI: *M. S. Clemens 8057d* (BS). CHIHLI: *M. S. Clemens 8057*, *8057a*, *8057b* and *8057c* (BS).

KOREA. *Faurie 556* (BS).

JAPAN. *Faurie 745* and *3588* (BS).

Ledebour used his name *P. polymorphum* for this species and Meisner accepted Ledebour's name. Both authors give the synonymy essentially as it is listed above, but they were not bound by a rule of priority. *P. angustifolium* appears clearly to be the earliest valid name. No reference has been found questioning the identity of Pallas' plant and it is assumed that Ledebour had access to authentic information when preparing the synonymy.

113a. **Polygonum angustifolium** Pall. var. **songaricum** (Schrenk) comb. nov.

P. songaricum Schrenk, Enum. Pl. nov. i. 8 (1841).

P. polymorphum f. *soongoricum* (Schrenk) Ledeb. p. 525 (1846–51).

Characterized by ovate, subcordate nearly glabrous leaves and erect sparsely branching stems.

Sungaria.

CHINA. SUNGARIA: *Karelin & Kiriloff 1915* (T).

113b. **Polygonum angustifolium** Pall. var. **diffusum** (Pall.) comb. nov.

P. diffusum Pall. ex Spreng. Syst. ii. 255 (1825).

P. polymorphum g. *diffusum* (Pall.) Ledeb. p. 525 (1846–51).

Distinguished by having diffusely branching stems and ovate to oblong-lanceolate leaves.

Temperate eastern Asia.

SIBERIA. Amur: *Topping 2463* (US).
CHINA. Manchuria: *Wilford* (GH, T).
JAPAN. Hokkaido: *Miyabe* (GH). Locality?: *United States Nat. Herb. 1396955.*

114. **Polygonum rumicifolium** Royle ex Bab. in Trans, Linn. Soc. xviii. 112 (1838); H. 51; G. 415.

Fagopyrum ramoso-spicatum Klotzsch in Bot. Ergeb. Waldem. Reise 136 t. 87 (1862), in syn.

P. ramoso-spicatum Klotzsch ex Hook. f. 51 (1886), in syn.

P. hissaricum Popov. in Not. Syst. Herb. Hort. Petrop. v. 38 (1925).

A glabrous or softly pubescent herb with a stout simple stem: leaves petiolate; blades broadly ovate, 4–12 cm. long, often cordate at the base and with undulate margins: flowers in dense terminal or axillary panicles: perianth deeply cleft, the lobes widely spreading, 5 mm. or more in diameter: achene acutely triangular, about as long as the perianth.

The region of the western Himalayas.

BRITISH INDIA. Kashmir: *Duthie* (UC); *R. R. Stewart* (MBG), *5919* (UC); *R. R.* and *I. D. Stewart 5857* (NY). Northwestern Himalayas: *T. Thomson* (GH).
AFGHANISTAN. Aitchison *794* (GH).
CHINA. Tibet: *Schlagintweit 7167* (GH).

No authentic specimen of *P. hissaricum* having been seen, it is uncertain whether the affinity of this plant is with *P. rumicifolium* or *P. angustifolium.*

115. **Polygonum polystachyum** Wall. Cat. n. 1686 (1828), nom. nud.; ex Meisn. in Wall. Pl. As. Rar. iii. 61 (1832); H. 50; G. 415; S. 183.

Peutalis polystachya Rafin. New Fl. Am. iv. 50 (1836)—acc. to Ind. Kew.??

"*P. molle* Don" Wight, Icon. v. t. 1807 (1852)—acc. to H. 50, where attributed to Wight.

A shrub 1–2 m. tall: leaves short-petiolate or subsessile; blades broadly lanceolate, caudate to acuminate at the tip, subhastately cordate to truncate or acute at the base, 5–15 cm. long: flowers in large spreading panicles; branches of the inflorescence often glabrate and sometimes recurved; perianth about 4 mm. long, the two outer segments larger than the three inner ones, not accrescent: achene triangular, included in the perianth.

Temperate regions in the Himalayas.

BRITISH INDIA. Sikkim: *Clarke 9786* (C), *25814-B* and *26083-A* (US); *Hooker* (GH); *King's Collector* (GH). Eastern Himalayas: *Cave* (BS—2

sheets). KUMAON: *Blinkworth* (C, M); *Strachey & Winterbottom 33* (GH). GARHWAL: *Schlagintweit 7811* (US), *9500* (GH), *Strachey & Winterbottom 32* (GH). PUNJAB: *Drummond 1425* (UC). CHAMBA: *Duthie* (UC). KASHMIR: *R. R. Stewart* and *5874* (NY). WESTERN HIMALAYAS: *Duthie 24909* (UC). NORTHWESTERN HIMALAYAS: *T. Thomson* (GH). HIMALAYAS: *Royle* (GH).

SIBERIA. TRANSBAICALIA: *Mixter* (US)?

116. **Polygonum tortuosum** D. Don, Prodr. Fl. Nep. 71 (1825); H. 52; G. 416.

P. tataricum Wall. ex D. Don 72 (1825), in syn.

A low shrub about 3–4 dm. high; profusely dichotomously branched: leaves subsessile; blades coriaceous, ovate or elliptic to orbicular, 1–4 cm. long: flowers in dense terminal panicles; perianth 2.5–3 mm. long.

The western Himalayas.

BRITISH INDIA. SIKKIM: *Smith & Cave 1867* (BS). KASHMIR: *R. R. Stewart*, *7437* and *7440* (NY).

CHINA. TIBET: *King's Collector 77* (US); *Schlagintweit 1844* (US), *2474* (M), *6204* (UC), *6395* (C), *6587* (GH), *6751* (US, M), *6879* (GH); *Strachey & Winterbottom 47* (GH); *T. Thomson* (GH, M).

117. **Polygonum perigrinatoris** Paulsen in Hedin, S. Tibet vi. Pt. 3, p. 87 t. II. f. 4 (1922).

A perennial herb with habit much like *P. tortuosum* but with smaller pubescent or strigose leaf blades with undulate revolute margins.

Tibet.

Not seen.

118. **Polygonum Chaneyi** B. Fedtsch. in herb. [PLATE IV. A.]

Herba glabra suberecta flexuosa; caulibus inaequaliter dichotomis ramis subadpressis; ocreis membranaceis delicatule sed sublente distinctissime nervatis; foliis petiolatis, lamina integerrima oblongo-lanceolata vel ovata 2–6 cm. longa; spicis terminalibus districtis plus minusve densifloris; ocreolis hyalinis pleurmque unifloris; pedicellis longitudine quam ocreolae brevioribus; perianthio ex sicco ut videtur viridi-albo 5-fido 2.5 mm. longo.

An erect glabrous herb with strict unequally dichotomous branches: ocreae membranous, distinctly veined: leaves petiolate; blades entire, oblong-lanceolate to ovate, 2–6 cm. long, somewhat chartaceous, only the midvein prominent: spikes terminal, scattered, more or less densely flowered: ocreolae hyaline, oblique, usually 1-flowered: pedicels shorter than the ocreolae: perianth apparently greenish white, 5-cleft, 2.5 mm. long; lobes 3-veined: stamens 8: ovary 3-sided, capped by 3 short-stalked stigmas.

Altai Mountains of Mongolia.

CHINA. MONGOLIA: *Chaney 228* (GH, UC).

This material was collected in 1925 on the third Asiatic Expedition of the American Museum of Natural History. Professor Fedtschenko's herbarium name has been used for this species, though no published description of his has been seen.

119. **Polygonum divaricatum** L. Sp. Pl. 363 (1753); F. & H. 339; N. 21; Mat. 56.

P. ocreatum L. op. cit. 361 (1753)—acc. to M. 57 and in DC. 141 = var. *ocreatum*.

P. Laxmanni Lepech. in Nov. Act. Acad. Petrop. x. 414 t. 13 (1797).

P. angustifolium hort. ex Poir. in Lam. Encyc. vi. 139 (1804) = *P. Laxmanni* acc. to M. in DC. 140.

P. acidulum Willd. Enum. Hort. Berol. 429 (1809)—acc. to M. in DC. 141 = var. *angustissimum*.

P. flexuosum Pall. ex Ledeb. 526 (1846–51), in syn. = var. *glabrum*.

P. minutiforum Nakai in B. M. T. xxv. 63 (1911). *P. divaricatum* var. *micranthum* Ledeb. is given as a syn.

Persicaria divaricata (L.) H. Gross in B. G. B. xxiii. 29 (1913).

P. limosa Komarov in Bul. Jard. Bot. St. Pétersb. xvi. 165 (1916) [Not seen].

Aconopogon divaricatum (L.) Nakai in Mori, Enum. Pl. Cor. 129 (1922).

Aconopogon ochreatum (L.) Nakai in Mori, l. c. (1922).

Persicaria minutiflora Nakai in Mori, op. cit. 133 (1922).

A dichotomously branching usually slender-stemmed mostly glabrous herb: leaves subsessile, lanceolate to linear: inflorescence of slender lax dichotomously branching panicles; flowers subsolitary and exserted from membranous ocreolae; perianth 2.5–3 mm. long: achene sharply triangular, 2–3 times the length of the perianth.

Temperate eastern Asia.

SIBERIA. TRANSBAICALIA: *Karo 27* (MBG—2 sheets), *206* (MBG—4 sheets); *Turczaninow* (C). AMUR: *Korshinsky* (GH); *Maximowicz* (GH, T); *Stratonovicz* (UC). OCHOTSK: *Wright* (GH, US, T).

CHINA. MONGOLIA: *Chaney 206* (UC). MANCHURIA: *Komarov 564* (GH, BS); *Schrenk* (GH, T). CHIHLI: *J. C. Liu 1031* (UC). HUPEH: *C. F. Li 10873* (NY).

JAPAN. WITHOUT LOCALITY: *Herb. O. Ames.*

120. **Polygonum sibiricum** Laxm. in Nov. Com. Acad. Petrop. xviii. 531 t. 7 f. 2 (1774); F. & H. 349; S. 183.

P. hastatum Murr. in Nov. Com. Götting. v. 37 t. vi. (1774), acc. to F. & H. l. c.

P. crassifolium Murr. Syst. Veg. ed. 14. 378 (1784). *P. sibiricum* is given as a syn.

P. arcticum Pall. ex Spreng. Syst. ii. 258 (1825), acc. to Ind. Kew.
P. coarcticum Willd. ex Spreng. op. cit. 255 (1825), acc. to Ind. Kew.
Persicaria sibirica (Laxm.) H. Gross in B. G. B. xxiii. 30 (1913).

A glabrous branching erect or decumbent herb 5–30 cm. high: leaves short-petiolate; blades punctate beneath, coriaceous, oblong to linear-lanceolate, sometimes hastate, 2–6 cm. long: flowers congested, in a few-branched terminal usually pyramidal panicle: ocreolae several-flowered: flowers exserted and disjointing at the top of the pedicels: perianth about 2 mm. long: achene triangular, not winged.

Northeastern Asia.

SIBERIA. Irkutsk: *Krystofowitsch* (UC). Transbaicalia: *Besser* (GH); *Fischer* (GH); *Karo 87* (MBG—2 sheets); *Turczaninow* (C).
CHINA. Tibet: *Schlagintweit 6281* (GH); *Strachey & Winterbottom 48* (GH); *T. Thomson* (GH). Sungaria: *Bunge* (GH, MBG); *Ledebour* (MBG); *Regel* (GH); *Schrenk* (GH, US). Mongolia: *Chaney 157* (UC), *595* (GH, UC, NY). Manchuria: *U. California 373761*. Chihli: *M. S. Clemens 8056* and *8056a* (BS); *J. C. Liu 757*, *867* and *1975* (UC). Hupeh: *C. F. Li 10645* (NY).

120a. **Polygonum sibiricum** Laxm. var. **Thomsonii** Meisn. in herb. [Plate IV. B.]

"*P. sibiricum* Laxm." of H. 52 (1886).

Herba glabra nana multicaulis 2–5 cm. alta; foliis petiolatis, lamina anguste lineari plerumque hastata 5–10 mm. longa; paniculis terminalibus ovoideis haud vel vix pyramidatis; perianthio 2 mm. longo.

A dwarf many-stemmed glabrous herb 2–5 cm. high: leaves petiolate; blades narrowly linear, usually hastate, 5–10 mm. long: inflorescence of ovoid terminal panicles scarcely if at all pyramidal, often exceeded by the upper leaves: perianth 2 mm. long.

Northwestern Himalayas.

BRITISH INDIA. Northwestern Himalayas: *R. R. Stewart* (NY).
CHINA. Tibet: *T. Thomson* [*Polygonum 37*] (GH, C, M).

On the Tibetan specimen cited above from the Meisner Herbarium notations appear in Meisner's hand writing showing that in 1864 he considered this plant as a new species, but that in 1867 he placed it as a variety of *P. sibiricum*. No publication of either the species or the variety has been discovered.

121. **Polygonum Hookeri** Meisn. in Ann. Sci. Nat. V. vi. 352 (1866); G. 417; S. 184.

P. acaule Hook. f. Icon. Pl. xv. t. 1490 (1885), not of Boiss.
Persicaria acaulis (Hook. f.) H. Gross in B. G. B. xxiii. 28 (1913).
Rheum hirsutum Maxim. ex Sam. 184 (1929), in syn.
Rheum nanum Lingelsh. ex Sam. 184 (1929), in syn.

A low hirsute caulescent herb from a stout perennial rootstock: leaves sessile; blades oblong, obtuse, tapering to a narrow base, up to 15 cm. long: inflorescence a pyramidal terminal panicle; flowers crowded, deep crimson; perianth 2–3 mm. long: achene triangular, exceeding the perianth.

The Himalayas and western China.

BRITISH INDIA. Sikkim: *Hooker* [*Polygonum ?0*] (GH, C, M).
CHINA. Tibet: *Younghusband 228* (GH). Yunnan: *Forrest 21536* (UC, US); *Rock 4342* (UC, US), *5013* and *9556* (US), *9558* (UC, US, NY) *9642* (GH, UC, US); *Schneider 1835* (GH). Szechuan: *Forrest 21243* (UC, US).

122. **Polygonum sericeum** Pall. Reise iii. 286, 320 (1776); Led. 527; M. in DC. 139; Herder in A. H. P. xi. 262.

Persicaria sericea (Pall.) H. Gross in B. G. B. xxiii. 31 (1913).

Whole plant, including the perianth, sericeous: stems and inflorescence leafy: leaves subsessile; blades oval to oblong, 2–8 cm. long and exceeding the internodes: flowers in small clusters terminating the stem or in the upper axils: perianth reddish.

The Baical region and Mongolia.

SIBERIA: Irkutsk: *Besser* (GH); *Schschukin* (MBG). Transbaicalia: *Besser* (C); *Fischer* (GH, C); *Turczaninow* (C).

Section 8. FAGOPYRUM [Tourn.] Meisn. Monogr. 43, 61 (1826).

Key to Species.

a. Surfaces of the achenes grooved, the angles rounded at the bases and keeled towards the tips....*b*
  b. Plant annual and glabrous or nearly so: stem usually simple and erect.....123. *P. tataricum.*
  b. Plant perennial: stem shrubby at the base and decumbent 124. *P. suffruticosum.*
a. Surfaces of the achenes flat or concave, the angles acute....*c*
  c. Branches leafless above: flower-bearing branches never (or rarely) from leaf axils....*d*
    d. Inflorescence congested and head-like.....125. *P. Gilesii.*
    d. Inflorescence of spike-like branches....*e*
      e. A coarse herb from a perennial woody caudex....126. *P. Statice.*
      e. Low herbs without woody caudex....*f*
        f. Leaf blades triangular, bases sagittate or truncate 127. *P. leptopodum.*
        f. Leaf blades linear, bases hastate.....128. *P. lineare.*
  c. Branches more or less leafy above: flower-bearing branches often from leaf axils....*g*
    g. Plant woody.....129. *P. urophyllum.*
    g. Plants herbaceous....*h*
      h. Flowers laxly arranged and often on drooping branches 130. *P. gracilipes.*
      h. Flowers densely arranged and usually on erect branches ....*i*

i. Cultivated annual (often escaped): inflorescence in sub-capitate cymes.....131. *P. Fagopyrum.*
i. Perennial from a woody caudex: inflorescence of rather distinct spikes.....132. *P. cymosum.*

123. **Polygonum tataricum** L. Sp. Pl. 364 (1753); F. & H. 350; S. 185.

Fagopyrum tataricum (L.) Gaertn. Fruct. ii. 182 t. 119 f. 6 (1791).

Fagopyrum dentatum Moench, Meth. 290 (1794), based on *P. tataricum.*

P. sinarum Desv. ex Meisn. 62 (1826), in syn.

Fagopyrum rotundatum Bab. in Trans. Linn. Soc. xviii. 117 (1838) — acc. to H. 55.

Helxine tatarica (L.) Kuntze, Rev. Gen. i. 553 (1891).

A glabrous annual with usually simple stems up to 1 m. tall: leaves petiolate; blades broadly triangular, 2–8 cm. long, cordate or hastate at the base: flowers in axillary or terminal peduncled clusters: achene about 5 mm. long, with 3 deep grooves and the angles rounded, except at the tip.

Temperate Eurasia.

BRITISH INDIA. Sikkim: *Hooker* (GH); *Schlagintweit 12567* (M). Kumaon: *Strachey & Winterbottom 31* (GH). Kashmir: *R. R. Stewart 3399* (NY).

CHINA. Tibet: *T. Thomson* (GH, NY). Yunnan: *E. E. Maire 146* (UC). Shansi: *M. S. Clemens 8050* (BS). Chihli: *J. C. Liu 550* (UC). Hupeh: *Henry 1351* (GH).

124. **Polygonum suffruticosum** (F. Schm.) Komarov in Act. Hort. Petrop. xxii. 145, 776 (1904).

Fagopyrum suffruticosum F. Schm. in Mém. Acad. Sci. St. Pétersb. ser. VII. xii. No. 2, p. 170 (1868). [Reis. im Amurl.]; Gross in B. G. B. xxiii. 23.

A plant closely allied to *P. tataricum* but differing in having stems which are decumbent and suffruticose, especially at the base; flowers long-pedicelled; and the angles of the achene usually unidentate.

Sakhalin.

Not seen.

125. **Polygonum Gilesii** Hemsl. in Hook. Icon. Pl. xviii. t. 1756 (1888); G. 410; S. 187.

A glabrous plant with elongated Ephedra-like nearly leafless branches: leaves distinctly petiolate; blades fleshy, cordate, about 1 cm. broad: flowers in clusters terminating the slender branches, short pedicellate: achene triangular, smooth, exceeding the perianth at maturity.

Region of the northwestern Himalayas and southward into Afghanistan.

Not seen.

Both Samuelsson, l. c., and Gross[1] have considered this species as belonging to § *Fagopyrum* rather than to § *Cephalophilon* in which it was placed by Hooker at the time of the original description, and in this opinion the writer concurs.

126. **Polygonum Statice** Lévl. in Fed. Rep. vii. 338 (1909); S. 186.

Fagopyrum Statice (Lévl.) H. Gross in B. G. B. xxiii. 26 (1913).

An erect glabrous herb from a perennial woody caudex: stems branching, leafless above: leaves long-petiolate; blades triangular to ovate, cordate to nearly truncate at the base, 1.5–3. cm. long: inflorescence of erect rather densely flowered lateral or terminal spikes: ocreolae 2.5 per cm.: flowers several from each ocreola: perianth 1–2 mm. long: achene triangular, about 2.5 mm. long.

Southwestern China.

CHINA. YUNNAN: *Henry 9305* (US, NY).

127. **Polygonum leptopodum** Diels in Not. Bot. Gard. Edinb. v. 260 (1912); S. 187.

P. Grossii Lévl. in Fed. Rep. xi. 297 (1912)—acc. to S. 188 = var. *Grossii*.

Fagopyrum Grossii (Lévl.) H. Gross in B. G. B. xxiii. 26 (1913).

A more or less branching subglabrous herb 6–25 cm. tall: branches slender, leafless above: leaves petiolate; blades triangular, 6–25 mm. long, bases sagittate or truncate, veins rather prominent beneath and sometimes scabridulous: inflorescence of dense spikes 5–15 mm. long borne on slender peduncles: ocreolae somewhat keeled: flowers exserted; perianth white or pink, 1–2 mm. long; styles 3.

Yunnan Province, China.

CHINA. YUNNAN: *E. E. Maire 3669* and *3669-B* [Bonati] (UC); *Rock 4900* (US), *6133* (GH, US, NY), *10700* (UC, US); *Schneider 2015* (GH), *3110* (GH, US).

128. **Polygonum lineare** Sam. in Hand.-Maz. Symb. Sin. vii. 188 t. III. Abb. 5 (1929).

A slender branching glabrous annual: stems striate or subangular: leaves slenderly petiolate; blades linear, hastate, 1–2 cm. long: inflorescence in terminal spikes 4–8 mm. long on slender peduncles: perianth white or rose, about 1 mm. long, exserted on slender pedicels: achene triangular, included.

Yunnan Province, China.

[1] Gross in Engl. Bot. Jahrb. xlix. 272.

CHINA. YUNNAN: *E. E. Maire 154/1906* and *402/1906* (BS), *2369/1906* (US, BS).

129. **Polygonum urophyllum** Bur. et Franch. in Journ. de Bot. v. 150 (1891); Lévl. in Bul. Soc. Bot. Fr. lvii. 445; Rehder in Journ. Arn. Arb. x. 184; S. 186.

P. Maireii Lévl. in Fed. Rep. vii. 338 (1909)—acc. to S. l. c.

Fagopyrum Maireii (Lévl.) H. Gross in B. G. B. xxiii. 25 (1913).

Fagopyrum urophyllum (Bur. et Franch.) H. Gross, op. cit. 21.

Plant with woody stems on which there are produced condensed leafy shoots and also slender elongated herbaceous shoots which usually branch into lax inflorescences above: leaves petiolate; blades narrowly acuminate at the tips and rather broadly sagittate at the base, 2–8 cm. long: flowers laxly arranged on the branches of open panicles: perianth about 3 mm. long, not winged in fruit.

Western China.

CHINA. YUNNAN: *Forrest 9952* (UC, AA); *Henry 9133* (US, AA, NY—3 sheets); *E. E. Maire* (AA), *849* [phot., AA] (Edinburgh), *2617* (UC, BS), *3367-B* (BS), *7476* and *7481-B* (UC), *7482* (GH, UC), *7482-B* (US, BS); *Schneider 7753* (GH); *Schoch 152* (US, AA); SZECHUAN: *Schneider 1141* (AA).

130. **Polygonum gracilipes** Hemsl. in Journ. Linn. Soc. xxvi. 340 (1891); S. 187.

Fagopyrum gracilipes (Hemsl.) Dammer in Diels in Engler. Bot. Jahrb. xxix. 315 (1900) [Fl. Cent. China].

P. Bonatii Lévl. in Fed. Rep. viii 258 (1910)—acc. to S. l. c.

Fagopyrum Bonatii (Lévl.) H. Gross in B. G. B. xxiii. 25 (1913).

Fagopyrum odontopterum H. Gross, l. c. (1913)—acc. to S. l. c. = var. *odontopterum*.

An erect hispidulous more or less branching annual: leaves slenderly petiolate; blades ovate to triangular, cordate to hastate at the base, 2–4 cm. long: flowers scattered on more or less pendulous axillary branches, exserted on slender pedicels: perianth 1–2 mm. long: achene triangular, about 3 mm. long, included in the accrescent perianth.

Western China.

CHINA. YUNNAN: *Henry 9133-A* (NY); *E. E. Maire 350* and *363* (UC), *448/1914*, *6445* (GH, UC), *6449-B* (BS). SZECHUAN: *Faber 846* (NY). HUPEH: *Henry* and *4789* (GH).

131. **Polygonum Fagopyrum** L. Sp. Pl. 364 (1753); F. & H. 339; Mats. & Hay. Enum. Pl. Form. 334; S. 185.

Fagopyrum esculentum Moench, Meth. 290 (1794), based on *P. Fagopyrum*.

P. emarginatum Roth, Catalect. Bot. i. 48 (1797)—acc. to H. 55 = *Fagopyrum esculentum*.

Fagopyrum emarginatum (Roth) Moench, Meth. Suppl. 100 (1802); and of M. in DC. 143.

P. volubile Turcz. in Bul. Soc. Nat. Mosc. 1840 p. 77.

P. dioicum Hamilt. ex M. in DC. 143 (1856); in syn. = *Fagopyrum esculentum.*

An erect branching glabrous annual up to 1 m. tall: leaves petiolate; blades triangular, 2–8 cm. long, with bases cordate and tips acute: flowers in axillary and terminal peduncled congested cymes; perianth pink or white, 2–3 mm. long: achene acutely triangular, about 5 mm. long; surfaces dull brown.

Temperate Eurasia.

BRITISH INDIA. NEPAL: *Lindley* (T); *Wallich 1687/1* (M). KUMAON: *Strachey & Winterbottom 29* (GH). NORTHWESTERN HIMALAYAS: *T. Thomson* (GH). WITHOUT LOCALITY: *Wallich 1687-B* (GH).

AFGHANISTAN. *Griffith 4132/1* (GH).

SIBERIA. IRKUTSK: *Jurinsky* (UC).

CHINA. TIBET: *Schlagintweit 5544* (GH), *5815* (M), *6207* (GH, M). MONGOLIA: *Chaney 448* (UC). MANCHURIA: *Wilford* (T). YUNNAN: *Henry 9314* (NY); *E. E. Maire 145* (BS). SZECHUAN: *W. P. Fang 2573* (NY). SHANSI: *N. Han 38* (UC); *K. Ling 1481* (UC). CHIHLI: *M. S. Clemens 1766, 8050a* and *8050b* (BS); *J. C. Liu 1118* (UC). SHANTUNG: *M. S. Clemens* (BS). HUPEH: *Henry 1369* (GH). ANHWEI: *R. C. Ching 4293* (UC); *Mc Clure 3348* and *3380* (UC). KIANGSU: *C. Y. Chiao 71* and *309* (UC); *Herb. U. Nanking 221* (UC, BS). KWANGSI: *McClure 1777* (UC). KWANGTUNG: *Groff 111* (UC); *Tsang & Wong 2523* (UC).

KOREA. *Gilbert* and *110* (UC—2 sheets); *Wilford* (GH).

JAPAN. HONDO: *Maximowicz* (C). KIUSIU: *Oldham 697* (GH), *701* (C). LOCALITY?: ["Simoda"] *Williams* (GH—2 sheets); *Wright* (GH, C). WITHOUT LOCALITY: *Herb. Lugd.-Bat. 8* (M).

FORMOSA. *Faurie 760* (BS).

This species is commonly cultivated for its starchy seed which is the source of Buckwheat flour. *P. volubile* is characterized by "Folia Polygoni Tartarici et Fagopyri, a quibus praeter caulem volubilem diversem racemis capitatis pedunculis filliformibus insidentibus, a priore adhuc floribus majoribus albis et margine fructum edentulo."

132. **Polygonum cymosum** Trev. in Nov. Act. Acad. Caes. Leopold Nat. Cur. xiii. 177 (1826); F. & H. 337; S. 185.

P. dibotrys D. Don, Prodr. Fl. Nep. 73 (1825)—acc. to F. & H. l. c.

P. Fagopyrum Hamilt. ex D. Don, l. c. (1825), in syn., not of Linn. = *P. dibotrys.*

P. acutatum Lehm. Pugill. i. 28 (1828)—acc. to F. & H. l. c.

"*P. emarginatum* Roth" of Wall. Cat. n. 1688 (1828)—acc. to H. 55 = *Fagopyrum cymosum.*

P. triangulare Wall. Cat. n. 1689 (1828), nom. nud.; ex M. in W. 63 (1832), in syn. = *Fagopyrum triangulare.*

Fagopyrum cymosum (Trev.) Meisn. in W. 63 (1832).

Fagopyrum triangulare Meisn. in W. l. c. (1832)—acc. to F. & H. 337.
P. rugosum Hamilt. ex Endl. Gen. Suppl. IV. ii. 49 (1847), in syn.
= *Fagopyrum cymosum*, acc. to H. 55.
Helxine acutata (Lehm.) Kuntze, Rev. Gen. 553 (1891).
P. Labordei Lévl. et Van. in B. G. B. xi. 344 (1902)—acc. to S. l. c.
P. tristachyum Lévl. in Fed. Rep. xi. 297 (1912)—acc. to S. l. c.
Fagopyrum tristachyum (Lévl.) H. Gross in B. G. B. xxiii. 26 (1913).

A tall puberulous perennial branching herb: leaves long-petiolate; blades triangular, up to 10 cm. broad: inflorescence of axillary or terminal panicles; spikes often rather laxly flowered; flowers secund; perianth about 2 mm. long: achene triangular, acutely angled, twice as long as the perianth.

Continental temperate eastern Asia.

BRITISH INDIA. SIKKIM: *Hooker* (GH). NEPAL: *Wallich 1689/1* (M). KUMAON: *Strachey & Winterbottom 30* (GH). KASHMIR: *Schlagintweit 4257* (M). WESTERN HIMALAYAS: *Duthie 24919* (UC); *Schlagintweit 3095* (GH); *T. Thomson* (GH). HIMALAYAS: *Dudgeon & Kenoyer* (MBG). WITHOUT LOCALITY: *Wallich 1688* (GH).

CHINA. TIBET: *Schlagintweit 13* (GH). YUNNAN: *Henry 9278* (NY—3 sheets), *9278-A* (US), *11132* and *12655* (NY—2 sheets each); *E. E. Maire 30* (BS), *290/1914* [Edinb. *367*] (UC), *6338* (GH, UC), *6338-B* [Bonati] (BS); *Schneider 2283* (GH). HUPEH: *Henry 2716* (GH—2 sheets), *4327* (GH), *7688* (NY); *E. H. Wilson 2622* (NY). CHEKIANG: *Allison 35* (GH); *H. H. Hu 1465* (BS). KWANGTUNG: *To, Ts'ang & Ts'ang 628* (UC, US)?; *Tsang & Wong 3147* (UC)?

UNCLASSIFIED AND EXCLUDED NAMES.

The names cited below have been excluded from the systematic treatment because their identity and proper location in the scheme of classification were not clear to the writer.

Aconopogon micranthum Nakai in Mori, Enum. Pl. Cor. 129 (1922), nom. nud.
Bistorta incana Nakai, op. cit. 130 (1922), nom. nud.
Persicaria glandulosa Nakai et Ohki in Sasaki, List Pl. Form. 169 (1928), nom. nud.
Persicaria Hosseusii Lévl. in Fed. Rep. xi. 496 (1913).
Persicaria laxiflora Nakai in Mori, op. cit. 132 (1922), nom. nud.
Persicaria trigonocarpa (Mak.) Nakai in Sasaki, op. cit. 171 (1928), nom. nud.
Pleuropterus hypoleucus Nakai in Sasaki, l. c. (1928), nom. nud.
Polygonum alopecuroides Turcz. ex Steud. Nom. ed. 2. ii. 374 (1841), nom. nud.
P. Bodinieri Lévl. & Van. in B. G. B. xi. 343 (1902).
P. ciliatum Lour. Fl. Cochinchin. 243 (1790).

P. Cumingianum Gdgr. in Bul. Soc. Bot. France lxvi. 224 (1919).
P. fluviatile Hamilt. ex Endl. Gen. Suppl. IV. ii. 47 (1847).
P. gloriosum Lévl. in Fed. Rep. xiii. 338 (1914).
P. hangchouense Matsuda in B. M. T. xxvii. 9 (1913).
P. manshuriense Petrov. ex Komarov in A. H. P. xxxix. 55 (1923).
P. omerostromum Ohki in B. M. T. xxxix. 262 (1925).
P. pacificum Petrov ex Komarov, l. c. (1923).
P. scabrinervum Royle ex Bab. in Trans. Linn. Soc. xviii. 101 (1838).
P. sumatranum De Br. in Miq. Pl. Jungh. 308 (1854).
P. tenellum Roxb. Fl. Ind. ii. 289 (1832).
Pteroxygonum Giraldii Dammer et Diels in Engl. Bot. Jahrb. xxxvi. Beibl. 82: 36 (1905).

III. LIST OF NUMBERED EXSICCATAE.

Collection or distribution numbers are in bold-face type. The numbers in parentheses are those of the species in the preceding systematic treatment. The letter "T-" preceding such numbers indicates the genus *Tovara*, while the letter "K-" indicates the genus *Koenigia*. All other numbers refer to species of the genus *Polygonum*.

Agudo (**J.**) **51** (66).
Aitchison (**J. E. T.**) **215** (13); **433** (56); **632, 655** (8a); **656** (7); **657** (95); **696** (7); **767** (23); **779** (8); **794** (114); **816** (1); **866** (54); **986** (68).
Allison (**A.**) **20** (64b); **24** (83); **28** (93b); **30** (40); **35** (132); **47** (50); **60** (103); **112** (8).
Alston (**A. H. G.**) **612** (56a); **1918** (56).
Alvarez (**R. J.**) **25230** (T-1c).
Anderson (**T.**) **1131** (78); **1132** (67).
Anglade (**L.**) **594** (49).
Annandale (**N.**) **1815** (56).
Arsin 19681 (110).
Asai (**S.**) **21486** (83).

Backer (**C. A.**) **5672** (57); **6178** (56a).
Baeani (**E. S.**) **31** (66); **15905** (49).
Baker 4107 (66).
Barchet (**S. P.**) **549** (40); **550** (40a); **551** (64b); **552** (8); **593** (35).
Barrow (**J. V.**) **3** (49).
Bartlett (**H. H.**) **6030** (103); **6046a** (67); **6191** (103); **6332** (68).
Bartlett & La Rue 50 (49); **292** (66, 66a); **324** (49).
Blume (**C. L.**) **60** (66); **102** (35); **104, 105, 106** (66); **110** (49); **111** (64); **114** (57); **115** (45); **116** (60); **117** (93d).
Boehmer (**L.**) **43** (64b); **139** (66); **184** (64b); **215** (56); **219** (93d).
Bohnhof (**H.**) **137** (40); **166** (8a); **173** (40); **185-C** (93); **190** (92); **203** (56); **215** (60); **218** (8); **247** (49b); **323** (83).
Bon 6206 (51).
Bona (**F. R.**) **87** (49); **127** (66); **385** (49).
Brandis (**D.**) **1400** (49).
Brink (**B. v.**) **1394, 2973** (56a); **3653** (64b); **4546** (93d); **4741** (66).
Brooks (**W. P.**) **381** (86a); **382** (64b); **383** (86a); **384** (40); **385** (56); **386** (92); **387** (102); **388** (95); **623** (T-1a); **710** (8a).

Bünnemeyer (A. B.) **984** (110); **2545** (68); **2587** (64); **2766** (66); **2779** (110); **2814** (66); **2994** (56a); **3011, 3761** (66); **4077** (66a); **4307** (66); **4517** (68); **4945** (66); **6819** (56a); **9459** (110); **10596** (60a).
Burkhill (I. H.) **497** (49); **2512** (93d); **2790** (49); **2792** (56b); **2823** (93d).
Burkill & Holttum 8424 (66a).

California (UC) **322733** (15).
Campbell (J.) **49** (14).
Chaney (R. W.) **157** (120); **206** (119); **228** (118); **239** (28); **312** (8); **316** (37); **336** (40); **337, 381** (8); **424** (40); **448** (131); **459** (8); **480** (113); **595** (120).
Chang (H. T.) **294** (40a); **299** (40).
Chen (Y.) **646** (92); **666** (103); **696** (68); **989** (86); **3123** (T-1a).
Cheo & Wilson 84 (103); **128** (89); **221** (T-1a); **234** (93d).
Chiao (C. Y.) **63** (T-1a); **71, 309** (131); **733** (8); **819** (64); **965** (64b); **976** (64); **1035** (68); **1036** (64); **1052** (40); **1063** (89); **1119, 1320** (64b); **1358** (84); **1431** (56).
Chien (S. S.) **5105** (103); **5233** (T-1a); **5258** (103); **5452** (86); **5532** (23a).
Ching (R. C.) **317** (40a); **353** (28); **375** (100); **517** (80); **537** (33); **593** (K-1); **594** (79); **915** (68); **1050** (33); **1093** (8); **1361** (8a); **1700** (93d); **1701** (64b); **1702** (84); **1817** (83); **1940** (62); **2293** (103); **2322** (T-1a); **3452** (50); **3491** (52); **3583** (65); **3598** (86a); **3631** (101); **3690** (T-1a); **3750** (103); **3779, 3821** (64); **3832** (86); **3902** (8); **3936** (50); **3944** (52); **4096** (64b); **4145** (89); **4152** (103); **4164, 4198** (68); **4205** (89); **4238** (40); **4293** (131); **4334** (35); **4348** (93d); **4421** (62); **4469** (86); **4502** (83); **4508** (103); **4516** (93a); **4527** (86); **4623** (48); **4625** (40); **4636** (35); **4642** (101); **4696** (60); **4705** (T-1a); **4706** (89); **4862** (103); **4967** (42); **5016** (103); **5041** (T-1a); **5158** (103).
Chun (W. Y.) **148** (64b); **163** (40); **5500** (93b); **6542** (60).
Chung (H. H.) **230** (60); **262** (49); **264** (56b); **583** (103); **1065** (49); **1182** (40a); **1199** (14); **1426** (40a); **1553** (66); **1759** (40a); **2158** (93d); **2195, 2304** (103); **2362** (84); **2374** (66); **2534** (56); **2576** (93d); **2662** (54); **2877** (66); **2942** (T-1a); **3006** (40); **3023** (84); **3042** (103); **3612, 3844** (84).
Clarke (C. B.) **138** (23); **3462** (59); **7515** (49a); **9696-B** (109); **9786** (115); **9904-A** (82); **9981-A, 9981-B** (19); **10093-B** (23); **11595-A** (14); **13413** (82); **13522-B** (23); **13579-A** (109a); **17240-D** (49a); **21432-A** (14); **22209-A** (2); **25814-B** (115); **25874-A** (109); **26083-A** (115); **27506-A** (109a); **31974** (14); **33495** (35); **33862-B** (49); **33871-B** (38); **34587-F** (14); **34857-C** (59); **34872-E** (14); **35347-B** (64); **35559-B** (14); **35586-B** (68); **36170-B** (67); **36946-C** (93); **38196-B** (76); **38481** (33); **40419-C** (93a); **40937-F** (T-1b); **42420-C** (83); **44681-B** (56a); **44720-D** (48); **44817-C** (110b).
Clemens (M. S.) **74** (66); **196** (93d); **1366** (83); **1367** (32); **1368** (64); **1369** (8); **1372** (68); **1373** (92); **1766** (131); **1770** (14); **1771** (8); **1772** (8a); **1773, 1773a** (37); **1774, 1774a** (35); **1774b** (40); **2114** (T-1c); **2156** (83); **5889** (64a); **8050** (123); **8050a, 8050b** (131); **8051** (43); **8052** (86a) **8052a** (86b); **8053, 8053a** (92); **8054, 8054a, 8054b** (83); **8055, 8055a** (37); **8056, 8056a** (120); **8057, 8057a, 8057b, 8057c, 8057d** (113); **8058** (32); **8058a** (28); **8059** (62); **8059a** (60); **8060, 8060a, 8061** (40); **8062, 8062a** (37a); **8063** (91); **8064, 8064a, 8064b** (40a); **8065, 8065a, 8065b, 8065c** (8a); **8066, 8066a** (14); **8087** (68); **9131** (66); **9798** (49); **10293** (49b); **15606** (66); **15649** (T-1c); **16346** (68); **16711** (49); **17037** (14); **17416** (64); **17418** (66); **18731** (90).
Clemente (L.) **5775** (45).
Colani (E.) **3.275** (49); **3282** (14).
Copeland (E. B.) **358** (49).
Cowdry (N. H.) **346** (14).
Craib (W. G.) **21, 181** (64).
Cuming (H.) **484** (93d); **627** (45); **1289** (14); **1377** (40b); **1641** (66); **2281** (93d).

Curran (**H. M.**) **4384** (68); **4879** (66); **11609** (64b); **11620, 15619** (66).
Curran, Merritt & Zschokke 16053, 16054 (66); **16055** (68); **16056** (66).

Danser (**B. H.**) **6668** (64b); **6715** (40a); **6748** (60).
Darling (**F. W.**) **51** (68).
David (**A.**) **2766** (28).
Dessiatoff (**N.**) **672** (7).
Devore & Hoover 117 (49).
Dorsett (**P. H.**) **3320** (32); **3578** (28).
Drummond (**J. R.**) **523** (14); **1425** (115); **1921** (97); **1924** (22); **22203** (3); **22205** (28); **22675** (23); **26769** (2); **26781** (40b); **26789** (49b); **26793** (59a); **26796** (40b); **26802** (64b); **26804** (23); **26813** (49).
Ducloux 485 (101); **537** (37); **538** (8a); **539** (103); **540** (109a); **541** (22a); **542** (67).
Dudgeon & Kenoyer 67 (76); **79** (14); **123** (60); **135** (68); **135a** (74); **136** (64b); **256** (20).
Dunn (**S. T.**) **3440** (68); **3452** (83); **3454** (93d); **3456** (84); **5458** (64); **5804** (40a); **6361** (40); **6362** (56); **6369** (65).
Duthie (**J. F.**) **4357** (19); **9711** (38); **10082** (96); **19001** (14); **22128, 24908** (68); **24909** (115); **24910** (28); **24919** (132); **26000a** (49b).

Edano (**G.**) **26910** (49).
Elmer (**A. D. E.**) **5679** (49); **5776** (64); **5793** (83); **5817, 5852, 5856, 5901** (66); **5968** (14); **5970** (38); **6261** (83); **6288** (66); **6603** (68); **7729** (93d); **8356** (64a); **8631** (83); **10438** (66); **10754** (T-1c); **11546** (**64**); **15415** (49); **18142** (45); **18313** (93d).
Endert 1487 (46); **3231** (93d).

Faber (**E.**) **244** (78); **839** (26a); **840** (50); **846** (130); **849, 850** (64); **857** (40a); **1765** (56); **1767** (89).
Falconer, 833 (2); **834** (14 and 17); **839** (40b); **841** (19); **842** (20).
Fang (**W. P.**) **1149** (68); **2471** (T-1a); **2573** (131); **2850** (109a); **3485** (66); **3492** (40); **3681** (100); **4031** (28).
Faurie (**U.**) **555** (62); **556** (113); **559** (96); **560, 561** (8a); **562** (7); **565** (62); **712** (108a); **716** (95); **723** (92); **726, 727** (60); **745** (113); **750** (60); **751** (93c); **752** (87); **753** (14); **754** (66); **755** (87); **756** (14); **757** (38); **758** (66); **759** (93d); **760** (131); **761** (84); **762** (101); **764** (84); **765** (93c); **766** (48a); **767** (64b and 56b); **768** (68); **770** (40a); **771** (40b); **772** (35); **1184** (84); **1187** (56); **1502** (66); **1503** (101); **1505, 1506** (64b); **3588** (113); **3594** (32); **3601** (84); **4218** (40); **4219** (90); **4228** (64); **4230, 4232** (40); **4234** (97); **4851** (8a); **4962** (64); **5131** (8a); **5132** (93b).
Feng (**H. T.**) **30** (40 and 52); **134** (40a); **161** (8a).
Fenix (**E.**) **114, 12622** (66); **12650** (49); **12893** (64); **24997** (93d); **26078** (56a); **26110** (35); **28153** (66).
Forbes (**H. O.**) **613** (64b); **795** (68); **972** (66); **1922** (66a).
Forrest (**G.**) **1060** (110b); **5513** (76); **5812** (30); **6275** (106); **8470** (103); **8583** (110b); **8735** (110); **9952** (129); **10456** (106); **11032** (23a); **11113** (22a); **11770** (T-1a); **11960** (101); **11992** (93); **19728** (34); **19908** (106); **21243, 21536** (121); **22288** (67).
Foxworthy (**F. W.**) **717, 750, 924** (66).
Fu (**H. Q.**) **6** (40a); **217** (52).
Fukien (**F. C. U.**) **767, 1096, 1119** (64b); **1135** (103); **1232** (93d); **1989, 2127** (64b); **2312** (40a); **2769** (56b); **2772** (64b); **2867** (101); **2892** (93a); **2896** (93d); **2984** (54); **3142** (103); **3148** (93d); **3389, 3443, 3681** (54); **3693, 3717** (64b); **3833** (54); **3849** (42); **3957** (56); **3971** (84); **4065-B, 4235** (64b); **4312** (64); **4407** (54); **4425** (56); **4497** (54); **4516, 4609** (64b); **4612** (54); **4643** (60); **4728, 4759** (64b); **4775** (56); **4776** (64b); **4877** (56); **4928** (64b); **4940** (84);

5145 (56b); **5282** (64b); **5318** (50); **5322** (84); **5325** (64); **5432** (56b); **5481** (50); **5557** (56b); **5664** (101); **5678** (56); **5909** (93d); **6049** (64b); **6166** (84); **6191** (56); **6222** (84); **6392** (64b); **6549** (84); **6859** (93d); **11003** (40); **11102, 11247** (84); **11276** (93d); **11285** (54); **11349** (50); **11378** (54); **11422, 11558, 11687** (93d); **11826** (50); **11936** (84); **11996** (40a); **12098, 12358** (50); **12400** (40); **12511** (8); **12545** (84); **12571, 12609** (64b); **12621, 12728** (84); **13017** (54); **13034** (8); **13317, 13444, 13508, 13633, 13731** (54); **13839** (64b).

Gallatly (Geo.) 175 (66); **952** (14).
Gammie (G. A.) 156 (42).
Garrett (H. B. G.) 71 (67).
Gilbert (K. S.) 107 (84); **110** (131); **121** (40); **123** (35); **141** (40).
Goder (A. E.) 2, 40 (49).
Griffing (J. B.) 2953 (8); **2962** (40a).
Griffith (W.) 1724 (10); **1726** (13); **1727** (or) **862, 1729** (17); **4096** (5); **4097-1, 4099, 4100** (14); **4103** (17); **4106** (60); **4107** (40b); **4109** (48); **4109/1** (56); **4114** (37); **4115** (49); **4116** (42); **4117** (45); **4118** (35); **4119** (33); **4122** (68); **4123** (76); **4124** (93); **4125** (90); **4125/1** (83); **4128** (110b); **4132/1** (131).
Groff (G. W.) 49 (83); **92** (56b); **111** (131); **146** (56); **241** (42); **587** (64b); **593** (56); **2285** (40a); **2393, 4211, 4436** (83); **6112** (49a).

Hallier (H.) 308 (35).
Han (N.) 29 (8); **38** (131); **62** (32).
Hance (H. F.) 761 (64b and 56b); **1028** (42); **1482** (93d); **6057** (60); **10506** (65); **10984** (40a).
Hance & Sampson 9392 (50).
Haniff 1214 (93d).
Harsukh 22741-C (49a).
Hawkes 54 (23).
Helfer (J. W.) 34 (35); **4102** (14); **4108** (56a); **4133** (64).
Henderson (M. R.) 17923 (66a); **17924** (66).
Henry (A.) 14 (103); **M-15** (61); **41** (66); **63** (101); **67** (56a); **82** (101); **88** (56a); **155** (66); **271** (38); **299** (66); **349** (40b); **349-A** (38); **412** (66); **419** (23a); **457** (83); **583** (40b); **628** (66); **685-A** (33); **809** (66); **1119** (67); **1121** (49); **1168** (49b); **1192** (38); **1286** (49); **1351** (123); **1369** (131); **1454** (26); **1472** (64b); **1542** (66); **1635** (83); **1668** (35); **1672** (64b); **1756** (14); **1771** (60); **1826** (49); **2026** (101); **2027** (93d); **2193** (66); **2261** (48); **2290** (103); **2332** (83); **2343** (101); **2360** (56a); **2372** (64b); **2407** (40); **2488** (101); **2521** (23a); **2716** (132); **2784** (50); **2785** (42); **2793** (93d); **3057** (50); **3232** (65); **3601** (14); **3659** (90); **3727, 4061-A** (26); **4327** (132); **4784** (T-1a); **4789** (130); **4790** (62); **4797** (64); **4803** (8a); **4860** (8); **4939** (64); **4951** (92); **4962** (103); **4996** (68); **5042** (92); **5068** (56); **5080** (86); **5113** (68); **5194** (8a); **5317** (26); **5816** (68); **6075** (70); **6743** (23a); **6953** (68); **6954** (67); **6956** (33); **7258** (86); **7408** (93a); **7414** (86); **7688** (132); **7741** (66); **7746** (14); **9007, 9007-A** (66); **9045** (72); **9078, 9078-A** (66a); **9133** (129); **9133-A** (130); **9245** (56b); **9245-B** (64); **9278, 9278-A** (132); **9279, 9279-A** (72); **9283** (110b); **9305** (126); **9314** (131); **9339, 9339-A** (68); **9454, 9454-A** (109a); **9665** (76); **9685, 9685-A** (33); **9751, 9751-A** (101); **9922** (66 and 72); **9923, 9923-A** (86); **9982** (66 and 72); **10044, 10044-A** (66); **10206-A, 10213** (67); **10383** (49); **10499, 10499-A** (73); **10802** (40); **11132** (132); **11351** (86); **11918-A** (93d); **11970** (66); **12071, 12071-A** (70); **12132, 12132-A** (66); **12187** (93); **12217** (64); **12220** (42); **12348** (66); **12519** (110b); **12526** (56a); **12655** (132); **12662, 12662-A** (68); **12667** (49); **12695** (66); **13201** (35).
Hers (J.) 454 (103); **813, 3043** (100).
Hohenacker (R. F.) 19a (15); **293, 968** (68); **969** (93); **1330** (60).
Holttum (R. E.) 9752 (56a).
Hongkong (H. H.) 10105 (66); **11176** (93).

Hooker (**J. D.**) **38** (34); **62** (98); **69** (109a); **70** (121); **71** (109).
Hooker & Thomson 21 (48); **58** (86).
Hosseus (**C. C.**) **31a** (38); **31b** (45); **345** (66); **355** (66a).
Hu (**H. H.**) **35** (56a); **468** (T-1a); **515** (65); **871** (83); **1294** (103); **1445** (52); **1446** (40a); **1457** (50); **1460** (101); **1465** (132); **1472** (83); **1511** (103).
Huk (**A.**) **42** (14); **67** (40b); **80** (35).
Hwang 193 (49b).

Inayat 20113 (78); **20122-b** (28).
Ip (**N. K.**) **1802** (40).

Jacquemont (**V.**) **773** (68); **884** (56); **1016** (28); **1049** (23); **1940** (17); **2296** (2).
Jenkins 505 (93).

Kanehira & Sasaki 21699 (103); **21806** (67); **21834** (68).
Karelin & Kiriloff 1028, 1030 (7); **1915** (113a).
Karo (**F.**) **27** (119); **49** (8); **87** (120); **206** (119); **213a, 213b** (113); **227** (60); **250** (28); **312** (113); **315** (92); **481** (60); **486** (8); **542** (56).
Katsumata 22044 (93d).
Kawakami 130 (101).
Kawakami & Nakahara 706 (40b); **707** (14).
Kembang (**T.**) **297** (66).
Keng (**Y. L.**) **560** (40a); **581** (89); **638** (103); **723** (84); **1002** (T-1a); **1005** (89); **1033** (62); **1474** (8); **1715, 1932** (103).
King's Collector 77 (116); **156** (93d); **243** (66).
Klemme (**W.**) **104, 139, 143, 164, 5681** (66).
Kloptov (**B.**) **733** (41).
Knorring (**O.**) **1090** (32).
Kobayasi (**Z.**) **695** (40b); **701** (49).
Komarov (**V.**) **541** (64); **543** (60); **554** (86); **555** (92 and 93); **556** (89); **563** (101a); **564** (119).
Koorders (**S. H.**) **23695-B, 26035** (66); **27898-B** (56); **28044-B** (83); **29352-B** (66).
Korthals 33 (68); **119** (53); **120** (56a); **121** (35); **122** (56a); **125** (93d); **127** (66); **133** (110); **134** (57); **135** (64); **136** (49); **137** (45); **138, 140** (66); **143** (56a); **144** (49); **146** (56a); **147** (49); **148** (93d); **149** (64); **150** (110); **152** (49); **155** (93d); **157, 158** (56a); **159** (60); **160** (66); **161** (83).
Kuntze (**O.**) **xi. 75** (70); **?706** (38); **2001-B** (66); **3228, 3253** (64b); **3442** (60); **3460** (14); **3522** (60); **3523** (64); **3557** (45); **3657** (66); **3658** (49); **3880** (64); **4197** (45); **4323** (56a); **4405** (64); **4426** (66); **4569** (68); **4588** (83); **4940** (49); **5335** (66); **5502** (35); **5503** (40b); **5517** (35); **5967** (64); **6297** (49); **6505** (83); **6513** (56a); **6592** (49); **6600** (40b); **6671** (70); **6737, 6738** (68); **6996** (14); **6998** (64); **7295** (14); **7562** (38).
Kurz (**S.**) **519** (14); **528** (49).
Kutscherovskaja (**S. E.**) **1695** (40).

Lace (**J. H.**) **1834** (56).
Lee (**C. O.**) **6069** (8); **6102** (40a).
Leeuwen 8549 (64b); **11405, 11944** (49).
Lete (**R.**) **160, 501** (49).
Levine (**C. O.**) **20** (93c); **161** (66); **198** (14); **218** (93d); **225** (66 and 83); **248** (51); **495** (83); **811** (35); **929** (42); **943** (64b); **1039** (56); **1134** (49); **1318** (64b); **1363** (84); **1412** (93); **1424** (49); **1428** (68); **1539** (93a); **1647** (93d); **1648** (56b); **1688** (66); **1773** (101); **1895** (51); **2155** (93d); **3346** (83); **3362** (56b); **3390** (40); **3405** (65); **3437** (101); **6387** (64b).
Levine, Buswell & To 6367 (65).

Levine & Groff 99 (66); **113** (38); **128, 161** (66).
Levine, McClure & To 6900 (68).
Li (C. F.) 10645 (120); **10864** (28); **10873** (119); **11161** (40); **11204** (97); **11208** (52); **11211** (68).
Ling (K.) 1481 (131); **1635** (91); **1860** (95); **1870** (8a); **1878** (40a); **1906** (32); **2252** (50); **2308** (103); **2384** (40); **2483** (T-1a); **2511** (50); **2553** (65); **2582** (T-1a); **2597** (35).
Liu (J. C.) 471 (8a); **550** (123); **680** (32); **757** (120); **775** (40a); **867** (120); **1027** (84); **1031** (119); **1118** (131); **1296** (40); **1299** (49b); **1323** (40a); **1503** (40); **1770** (8); **1969** (28); **1975** (120); **1993** (8); **2010** (64b); **2024** (40).
Loher (A.) 4595 (38); **4597** (14); **4598** (90); **4599** (49); **4601** (66 and 83); **4602** (66); **4606** (45); **5207** (68); **5816, 12348, 13028** (66).
Lugduno-Batavo (Herb.) 1 (86a); **3** (56a); **6** (43); **7** (101); **8** (131); **9** (T-1a); **10** (84); **13** (40); **13b** (50); **14** (7); **15** (42); **16** (35); **17** (84); **18** (92); **19** (40); **22** (56a); **23** (64b); **24** (88); **25** (56a); **30** (60); **31** (40a); **35** (93d); **37** (49); **39** (110); **40** (64b); **41** (66); **43** (53); **45** (93d); **46** (64); **48** (83); **51, 53** (64b); **56** (93d); **57, 59** (66); **61, 64** (93d); **65** (64); **68** (64b); **70** (56a and 66); **71** (56a); **72** (66); **73** (64); **74** (56a); **75** (64b); **76** (110); **77** (66); **78** (56a); **79** (93d); **82** (83); **83** (110); **85** (49); **86** (64); **87** (56a); **88** (66); **92** (64); **93, 94** (66); **95** (110); **96** (66); **98** (56a); **99** (66); **110** (49); **139** (66); **172** (T-1a); **174** (86a); **179** (101); **183** (50); **184** (42); **186** (56a); **187** (64b); **188** (50); **190** (56a); **191** (43); **193** (84); **194** (64b); **197** (T-1a); **198** (42); **199** (92); **200** (64b); **201** (83); **202** (43 and 86a); **202x** (43); **203** (66); **204** (64b); **205** (35); **207** (40); **218** (56c).

Maack (R.) 211-C (113); **480** (83); **493** (60).
Maingay (A. C.) 98 (23); **463** (64b); **464** (40a).
Maire (E. E.) 30 (132); **31** (103); **113** (109a); **127/1914** (33); **143** (48); **144** (37); **145** (131); **146** (123); **147** (42); **149** (40); **151** (56); **154/1906** (128); **156** (60); **157** (93b); **158** (68); **159** (66); **165, 166** (101); **168** (67); **290/1914** (132); **347** (67); **349** (40); **350** (130); **351** (66); **352, 354, 355** (40); **357** (56); **359** (68); **360** (37); **362** (66); **363** (130); **364** (66); **368** (40a); **369** (66); **370** (35); **371** (8a); **372** (14); **373** (68); **402/1906** (128); **448/1914** (130); **485/1914** (103); **526/1914** (35); **540/1914** (22a); **545** (103); **674** (8a); **675** (14); **849** (129); **1226** (103); **1550** (67); **1551** (66); **1556** (72); **1558** (40a); **2369/1906** (128); **3304** (8a); **3305** (14); **3367-B** (129); **3660, 3660-B** (67); **3669, 3669-B** (127); **3939, 3997, 3997-B** (103); **6181** (40a); **6196** (40); **6338, 6338-B** (132); **6345, 6345/B** (33); **6347, 6347-B** (67); **6371, 6371-B** (92); **6443, 6443-B** (23); **6446, 6446-B** (92); **6445, 6449-B** (130); **6454, 6454-B** (48); **6456, 6456-B** (35); **6707-B** (40); **7343, 7343-B** (37); **7356-B** (22a); **7364, 7364-B** (40); **7368-B** (101); **7464** (22a); **7467, 7467-B** (37); **7474, 7474-B** (22a); **7475** (67); **7476** (129); **7478, 7478-B** (68); **7479** (35); **7480** (40); **7481** (92); **7481-B** (92 and 129); **7482, 7482-B** (129); **7484, 7484-B** (35); **7491, 7491-B** (67); **7493, 7493-B** (109a); **7494, 7494-B** (40).
Malvar (A.) 267 (45).
Mangubat (L.) 272 (49).
Marave (R.) 141 (49).
Matsuda (E.) 696 (49b).
Mearns (E. A.) 51, 76 (66); **2262** (40b); **2280** (64b); **2376** (49); **2476, 2711** (66); **2794** (64); **2870** (83); **2961, 3223, 3414** (66); **4293** (64); **4364, 4368** (68); **4443** (66).
Mearns & Hutchinson 4761 (66).
Meebold (A.) 10860 (76).
Merrill (E. D.) 97 (45); **141, 151** (49); **191** (45); **210** (49); **717** (68); **744** (56); **745** (60); **746** (66); **747** (83); **768** (93c); **825** (14); **1445, 1610** (49); **1712** (56a); **1713** (90); **4242** (45); **4417** (66); **4428** (56); **4521** (90); **4805** (64); **5012** (45); **5780** (66); **6575, 7681** (64); **7705, 7749** (90); **7783** (38); **7809**

(60); **8008** (93c); **9465** (45); **9679** (60); **9681** (68); **9682** (93c); **9683** (93); **9698** (95); **9835** (14); **10039** (66); **10055** (83); **10065, 10093** (64b); **10136** (56); **10167** (68); **10808** (93); **10844** (T-1a); **10875** (49); **10901** (84); **11025** (93a); **11057** (68); **11195** (93a); **11254** (49b); **11401** (35); **11408** (40); **11409** (103).

Merritt (**M. L.**) **441, 591** (49); **861, 11034, 15851** (66).

Metcalf (**F. P.**) **414, 421** (40); **431** (60); **449** (54); **450** (84); **497** (64b); **499** (64).

Metcalf & Chang 190 (64b); **202, 217, 501** (56); **502** (50); **504** (64); **535, 536** (103); **543** (64); **566** (93a); **697** (54); **761** (8a); **764, 767** (54); **961** (64b); **965** (83).

Meyer (**F. N.**) **1127** (8).

Missouri (**M. B. G. Herb.**) **124621** (113).

Mjoberg (**E.**) **130** (93d).

Mokim (**S.**) **835** (45); **1130** (66).

Moninger (**M.**) **90** (49); **91** (66); **92** (56b).

Mori (**U.**) **694** (68); **703** (83); **707** (86a).

McClure (**F. A.**) **335** (93c); **748, 1076** (35); **1307** (56a); **1312, 1745** (93d); **1746** (56b); **1765** (52); **1777** (131); **1778** (65); **1779, 1783** (64); **1865** (83); **1993** (14); **2319** (49); **2470** (38); **2471** (40); **2667** (64); **3063** (66); **3064** (49); **3348** (131); **3361** (35); **3380** (131); **16022** (66).

McGregor (**R. C.**) **173** (93d); **688, 735, 847, 946** (66); **1350** (49); **2904** (45); **3467, 4328** (66).

McNur 7329, 11001 (66a).

Nakahara (**G.**) **347** (56a); **360** (35); **382, 429** (56b); **482** (101).

Nanking (**U. Herb.**) **102** (42); **221** (131); **222** (8); **223** (50); **225** (101); **226** (35); **228** (86b); **229** (T-1a); **230** (52 and 64b); **232** (42); **236** (64 and 64b); **1345** (52); **1558, 1586** (103).

Noerkas 316 (93d).

Norton (**J. B.**) **1500** (64b); **1501, 1502** (56).

Oldham (**R.**) **169** (64b); **419** (84); **420** (83); **423** (35); **425** (64b); **426** (49); **428** (14); **431** (86b); **433** (14); **434** (108a); **435** (93d); **436** (101); **687** (8a); **688** (50); **689** (56a); **691** (35); **692** (43); **693** (66); **694** (86a); **695** (84); **697** (131); **699** (103); **700** (101); **701** (131).

Palmer & Bryant 278, 427, 893, 946 (66).

Parker, (**L.**) **49** (35).

Paz (**A. la**) **5233** (45); **6093** (66).

Petelot (**A.**) **90** (35); **91** (40); **92** (14); **93** (45); **94** (64); **95** (66); **96** (35); **281** (38); **282** (40); **315** (60); **448** (44); **685** (83); **686** (76); **733** (56b); **791** (93d); **792** (49); **800** (93d); **1171-A** (101); **1509** (56b); **1517** (66); **1604** (110b); **1611** (64); **1612** (66); **1618** (69); **1622** (86); **1749** (54); **3260** (64); **3271** (49); **3273** (44); **3274** (64); **3277** (66); **3278, 3281** (44); **3282** (14).

Pierre (**L.**) **1045** (58).

Piper (**C. V.**) **598** (49).

Prain's Collector 54 (93d).

Pratt (**A. E.**) **115** (67).

Ptaschicki (**M. I.**) **381** (28).

Ramos (**M.**) **1832, 4789, 5048, 5338, 5454** (66); **6000** (60); **7002** (49); **7274** (66); **7811** (14); **7868** (45); **7902** (40b); **8117** (14); **14476, 33234** (66); **39686 & 42843** (49).

Ramos & Edano 40411 (68); **36712** (56a); **36726** (45); **38136** (66); **39020** (83); **39180** (64); **40277, 44894** (66); **45048** (60); **45238, 48324** (49); **48618, 49402** (66).

Read (**B. E.**) **713** (92); **714** (68); **717** (62).
Regel (**E.**) **73** (108).
Reillo (**J.**) **16322** (56a).
Reymond (**D. B.**) **144** (40); **222** (83).
Ridley (**H. N.**) **11957** (93d); **14518** (56b).
Ritchey (**G. E.**) **7462** (8).
Robinson (**C. B.**) **1192** (38); **1667** (60a); **6006** (49); **6529, 11592** (45): **14009** (66); **14120** (93c); **14121** (60); **14127** (56); **18119** (66).
Robinson & Ramos 11872 (45).
Rock (**J. F.**) **101, 102, 157, 218, 417, 443, 829** (66); **1017** (49); **1070, 1071, 1598, 1709, 1766, 1900, 1940, 2238** (66); **3341** (30); **3764, 4154** (26); **4342** (121); **4483** (67); **4662** (22a); **4704** (106); **4900** (127); **4904** (109a); **4930** (109b); **4966** (31); **5013** (121); **5015** (106); **5034** (37); **5152** (100); **5647** (109b); **5679** (30); **5728** (33); **5815** (23); **5855** (68); **5935** (80); **6004** (33); **6133** (127); **6205** (66); **6265** (109a); **6360** (106); **6375** (110b); **6446** (22a); **6596** (110b); **6616** (76); **6857** (110b); **6965** (101); **6979** (83); **7030** (110); **7617** (66); **9556, 9558, 9642** (121); **9697** (106); **9873** (22a); **10059** (29); **10393** (78); **10700** (127); **10729** (33); **11558** (35); **11677** (109b); **12757** (100).
Roshevitz (**R. J.**) **193** (7).

Salvoza (**etc.**) **29084** (45).
Santos (**J. K.**) **20, 218** (66); **31648** (64).
Sapün 2471 (110); **2476** (64).
Sasaki (**S.**) **171** (35); **697** (66); **698** (38); **699** (56); **700** (40); **702** (86b); **704** (50); **706** (93d); **738** (101); **21530** (49); **21547** (56b); **21576** (84); **21619** (40).
Sauliere (**A.**) **62** (93); **131** (68).
Savatier (**L.**) **1023** (64b); **1028** (40); **1031** (T-1a); **1036** (103).
Schipchinsky (**N.**) **460** (56); **494** (37).
Schlagintweit (**H.**) **13** (132); **162** (23); **216** (70); **386** (90); **806** (9); **825** (37a); **826** (40); **829** (40a); **841** (54); **863** (35); **865** (113); **1539** (17); **1844** (116); **1852, 2260** (68); **2384** (12); **2474** (116); **2578** (14); **2580** (38); **2743** (14); **2879** (20); **2975** (35); **3083** (113); **3095** (132); **3147** (113); **3303, 3440** (35); **3563** (23); **3564** (64); **3566** (113); **3965** (20); **4257** (132); **4258** (8); **4290** (16); **4312** (68); **4458** (35); **4459** (40); **4461** (56); **4613** (60); **4638** (8); **5129** (49b); **5319** (40a); **5544, 5815** (131); **6158** (40a); **6203** (20); **6204** (116); **6207** (131); **6281** (120); **6395** (116); **6409** (68); **6587** (116); **6594** (20); **6741** (113); **6751** (116); **6760** (20); **6865** (40); **6879** (116); **6889** (20); **7167** (114); **7328** (20); **7811** (115); **8759** (64b); **9500** (115); **9687** (11); **9870, 10014** (20); **10183** (14); **10190** (38); **10486, 10568, 10935, 10987, 11178** (14); **11366** (76); **11630** (14); **11761** (9); **12054** (20); **12567** (123); **12720** (49); **13167** (64b); **13209** (23); **13341** (68).
Schmurer 628 (66).
Schneider (**C.**) **1141** (129); **1360** (23); **1599** (40a); **1814** (31); **1835** (121); **1853** (22a); **1905** (22); **2007** (109b); **2015** (127); **2118** (109a); **2144** (106); **2183** (109b); **2206** (33); **2283** (132); **2520** (110b); **2588** (66); **2595** (110b); **2688** (72); **2725** (110b); **2741** (35); **2761** (110b); **2785** (48); **2831** (68); **2903** (67); **3051** (106); **3110** (127); **3318** (33); **3442** (30); **3675** (22); **3686** (67); **7753** (129).
Schock (**L.**) **62** (40a); **152** (129); **409** (T-1b).
Schrenk 97, 295 (11).
Sevrens (**O. F.**) **49** (66).
Silva (**J. De**) **1691/2** (14).
Simada (**Y.**) **705** (84).
Singh (**U.**) **46** (66); **211** (14).
Smith (**J. F.**) **92** (66).
Smith & Cave 1867 (116); **2643** (22).
Soochow (**Univ.**) **237** (93d).

Squires (**R. W.**) **31** (49); **101** (56a); **409** (40a).
Steward (**A. N.**) **208** (8); **424** (49b); **559** (83); **562** (89); **580** (103); **633** (40a); **634** (68); **665** (64b); **721** (64); **984; 1198** (T-1a); **1309** (40); **1525** (8a); **1550** (64b); **1684** (103).
Stewart (**R. R.**) **363** (64b); **438** (38); **1006** (9); **1389** (14); **1736** (64b); **1743** (76); **2692** (23); **2899** (67); **3230** (37); **3234, 3242** (40); **3396** (68); **3399** (123); **3558** (28); **3566** (82); **3577** (20); **4100½** (113); **4759** (3); **4813** (23); **4999** (96); **5478½** (67); **5639** (23); **5660** (78); **5874** (115); **5919** (114); **6310** (78); **6713** (11); **6773** (68); **7437, 7440** (116); **7488** (11).
Stewart (**R. R. & I. D.**) **5857** (114).
Strachey &Winterbottom 1 (33); **2** (20); **3** (19); **4, 5, 6,** (28); **7** (93); **8** (76); **9** (68); **10** (74); **11** (68); **12, 13, 14** (23); **15** (40b); **16** (56); **17** (56b); **18, 19** (49); **21** (8); **22, 23** (14); **24** (40); **25** (38); **26** (37); **27, 28** (98); **29** (131); **30** (132); **31** (123); **32, 33** (115); **34** (110a); **35** (109a); **36, 36½** (66); **37** (78); **38** (82); **39** (34); **40** (67); **41** (2); **43** (105); **44** (75); **45** (77); **46** (11); **47** (116); **48** (120); **49** (3).

Tanaka (**T.**) **140** (90); **100063** (54); **100117** (64b); **100274** (8); **100275** (40); **100276** (T-1a); **100277** (92); **100289** (56b); **100378, 100429** (50); **200010** (8a); **200180** (86a); **200270** (32); **200280** (56d); **200283** (92); **200368** (48); **200513** (40a); **200642** (93b).
Taquet 3140, 3141 (103).
Thomson (**T.**) **2** (9); **37** (120a).
Thwaites (**G. H. K.**) **2248** (45); **2250** (90); **2251** (68); **2907** (38); **3000** (49); **3348** (90).
Tirona (**J.**) **253** (49).
To (**K. P.**) **1827** (56a); **1863** (83); **3623** (101); **10607** (64b).
To & Fuson 2745 (66); **2980** (35).
To, Tsang & Tsang 347 (64); **467** (84); **468** (93d); **491** (64); **628** (132); **695** (93d); **958** (64b).
Tsang & Wong 2966 (93d).
Tokyo (**U. Herb.**) **1515** (84).
Topping (**D. L.**) **109, 113, 144** (66); **875** (40b); **2131** (32); **2364** (40); **2398, 2433** (62); **2474** (40).
Treutler 487 (67).
Tsang (**W. T.**) **130** (56); **371** (93d); **403** (49); **408** (56b); **508** (83); **540** (56b); **564** (83); **666** (49); **730** (93d).
Tsang & Wong 2335 (49); **2511** (66); **2523** (131); **2549** (83); **2557** (38); **2907** (T-1a); **3027** (66); **3107** (101); **3147** (132); **3220** (65).
Tsiang (**Y.**) **130** (40a); **730** (93d); **1190** (52); **1218** (86a); **1290** (103); **1300** (T-1a); **1370** (101); **1378** (66).
Tsoong (**K. K.**) **325, D-759** (64b); **1047** (56b); **1061** (40); **2280** (110); **3015-A 3015-B** (14); **3021** (66); **A-3045** (T-1a); **3045-B** (T-1a); **4313** (65); **4317-A, 4317-B** (86a); **4318** (86); **4322** (93b); **4324** (60); **4325** (64); **4328** (64b); **4329** (40); **4331** (56); **5009** (32).

United States (**Nat. Herb.**) **26163, 44487** (8a); **44488** (64b); **44489** (48); **44490** (108a); **44498** (26); **206136** (93b); **206138** (48); **350896** (108); **373761** (120); **516654** (23); **693952** (43); **1396929** (8a); **1396931** (108); **1396932** (42); **1396934** (64b); **1396935** (103); **1396938** (35); **1396939** (40); **1396941** (56d); **1396942** (56a); **1396943** (56); **1396945** (68); **1396949** (64b); **1396951** (56c); **1396953** (108a); **1396956** (40a); **1396958** (43); **1396959** (27); **1396960** (26); **1396963** (56); **1396964** (56d); **1396966** (60); **1396971** (48).

Vanoverberg (**M.**) **31** (66); **80** (60 and 56); **160** (66); **254** (68); **1181** (49); **1783** (64); **2206** (60); **3721** (66); **17699** (49).
Vriese (**W. H. de**) **97** (66); **98** (110); **100** (35); **101** (66); **118** (14).

Waitz 162, 163 (64); **164** (66).
Walker, 149 (68); **1762** (66).
Wallich (**N.**) **1683/4** (33): **1687/1, 1687-B** (131); **1688, 1689/1** (132); **1691/1, 1691/3, 1691-K** (14); **1694** (78); **1696/1** (83); **1697/1** (93); **1699-C** (76); **1700** (77); **1701, 1701-C** (68); **1702** (71); **1703** (74); **1704/1, 1704/2** (70); **1705/1, 1705/5, 1705/6, 1706, 1707, 1707-B** (66); **1708/3, 1708/5** (49); **1709/1** (49a); **1709/4** (45 and 49a); **1709-D** (45); **1711/2** (38 and 38a); **1713** (42); **1714/1, 1714/2** (40b); **1716/1** (23); **1717** (40a); **1718** (93d); **1721/1** (56); **1721/3** (**56a**); **1721-F** (59a); **1721-H** (59); **1723** (49 and 56b): **1723/1, 1723-B, 1723-C** (56b); **1725** (78).
Walton (**H. J.**) **94** (8).
Wang 560 (40a); **576** (64); **579** (66).
Warburg (**O.**) **11030** (64).
Wickes (**D. R.**) **40, 216** (37); **241** (**40**).
Wight (**R.**) **8** (45 and 49); **9** (49); **10** (38); **12, 2452** (14); **2453** (56a); **2454** (49); **2455** (38); **2456** (93); **2457** (68); **2458** (66); **2460** (93d).
Williams (**R. S.**) **965** (66); **998** (56); **1032, 1059** (66); **1147** (68); **1268** (66); **1355** (64a); **1450** (64); **1991** (49); **2009** (66); **2061** (45); **2106** (60a); **2542** (66).
Williams (**S. W.**) **18** (64b); **184** (40).
Wilson (**E. H.**) **437** (101); **805, 955** (67); **1069** (26); **1323** (**68**); **1409** (35); **1419** (101); **1478, 1593** (23a); **2076** (T-1a); **2186, 2392** (33); **2622** (132); **2630** (92); **2773** (83); **3183** (101a); **3184** (109a); **3185, 9112** (101a).
Winckel (**W. F.**) **1443-B** (49).
Windoe 298 (66).
Wright (**C.**) **240** (55); **249** (64b); **251** (66); **252** (84); **418** (66); **419** (14).
Wu (**S. T.**) **1121** (35).

Yates (**H. S.**) **83** (66a); **93** (66); **534** (66a); **641** (49); **1416** (64); **1497** (110); **1555** (66a); **1981, 2175, 2417** (66); **2467** (110); **2471** (64b); **2748** (66); **2838** (110).
Younghusband (**F. E.**) **228** (121).

Zabel (**H.**) **1, 3, 4** (99).
Zimmermann 196 (8); **242** (40); **581** (96); **590** (84).
Zollinger (**H.**) **2555** (14); **2966** (68).

IV. EXPLANATION OF PLATES.

Plate I.

A. Portion of spike of *Tovara virginiana* (L.) Rafin. var. *filiformis* (Thunb.) Steward, n. comb., in fruit (× 5). Photograph from R. C. Ching no. 4705 (UC).
B. Portion of inflorescence of *Polygonum macranthum* Meisn. var. *scabridum* Steward, n. var. (× 6). Photograph from Faurie no. 766 (BS).
C. Habit of *Tovara virginiana* (L.) Rafin. var. *apoensis* (Elmer) Steward, n. comb. Photograph from Elmer no. 10754 (BS).
D. Habit of *Polygonum venosum* Steward, n. sp. Photograph from MBG Herb. no. 124702, specimen coll. Gandoger.
E. Habit of *Koenigia islandica* L. Photograph from R. C. Ching no. 593 (GH).

Plate II.

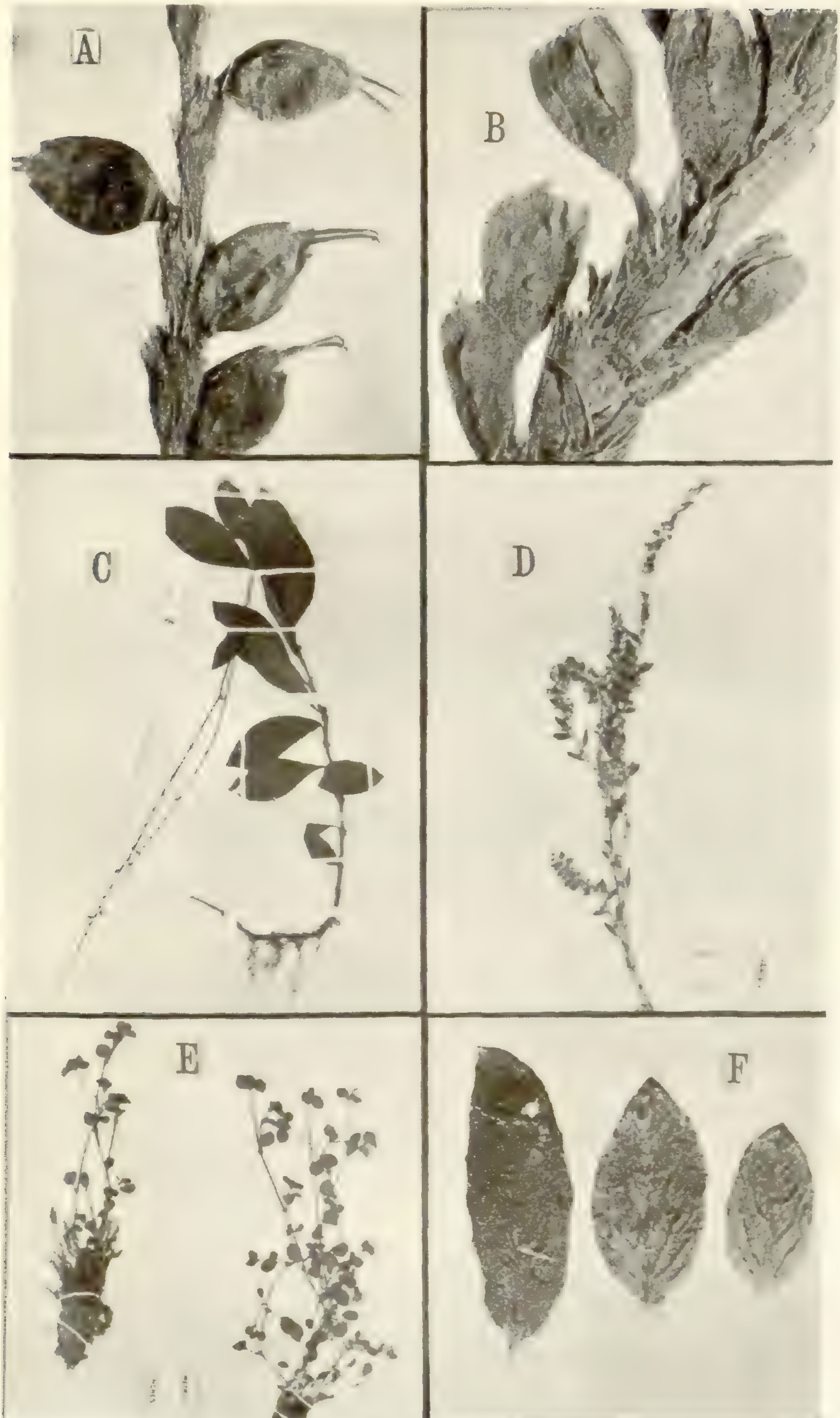
Above. 1 & 2. Perianth of *Koenigia islandica* L. (× 12).
3. Lower surface of leaf of *Polygonum venosum* Steward (× 8).
4. Perianth lobe of *Polygonum venosum* (× 23).
Below. Habit of *Polygonum macranthum* Meisn. var. *scabridum* Steward. Photograph from Faurie no. 766 (BS).

Plate III.

Habit of *Polygonum excurrens* Steward, n. sp. Photograph from Henry no. 4790 (GH).

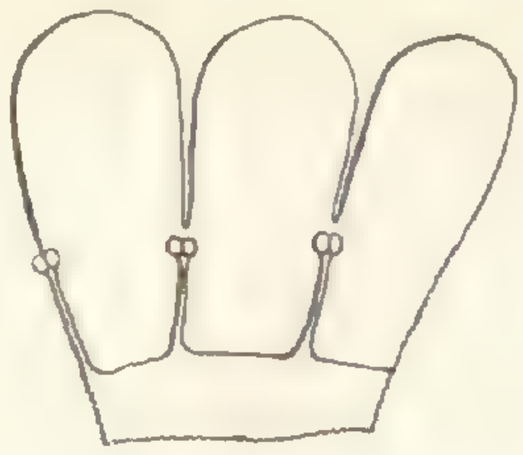
Plate IV.

A. Habit of *Polygonum Chaneyi* Fedtch. in herb. Photograph from Chaney no. 228 (UC).
B. Habit of *Polygonum sibiricum* Laxm. var. *Thomsonii* Meisn. in herb. Photograph from specimen coll. T. Thomson (GH).



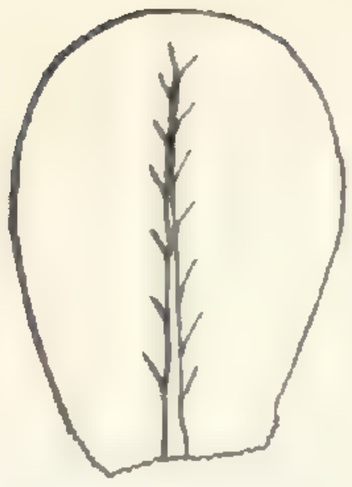
A. TOVARA VIRGINIANA V. FILIFORMIS (Thunb.) Steward.
B. POLYGONUM MACRANTHUM V. SCABRIDUM Steward.
C. TOVARA VIRGINIANA V. APOENSIS (Elmer) Steward.
D. & F. POLYGONUM VENOSUM Steward. E. KOENIGIA ISLANDICA L

1



2

3



4

Above. 1 and 2. KOENIGIA ISLANDICA L.
3 and 4. POLYGONUM VENOSUM Steward.
Below. POLYGONUM MACRANTHUM V. SCABRIDUM Steward.

POLYGONUM EXCURRENS Steward.

A. POLYGONUM CHANEYI Fedtsch.
B. POLYGONUM SIBIRICUM v. THOMSONII Meisn.

CONTRIBUTIONS FROM THE GRAY HERBARIUM
OF HARVARD UNIVERSITY.

LXXXIX.

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By Lyman B. Smith.

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STUDIES IN THE BROMELIACEAE.—I.

1. Notes preliminary to a Revision of the Bromeliaceae.

The present paper is the first of a series attempting to revise the Tribe *Tillandsieae* of the *Bromeliaceae* in such a way as to make possible the identification of specimens in fruit as well as in flower. Previous treatments have based their main headings to such an extent on the characters of the evanescent corolla and genitalia that by their keys identification of fruiting specimens is difficult or impossible. For instance, in the most recent treatment of the group, that of Mez[1] in 1896, the genera of the *Tillandsieae* are grouped according to the presence or absence of fusion between the petals, and *Vriesea* is distinguished from *Tillandsia* by the presence of scales at the base of the petals. Also within both *Vriesea* and *Tillandsia* the main groupings are on the basis of the relative length of the petals, stamens, and pistil.

These and similar floral distinctions would in many families be highly satisfactory. Here, however, they are singularly ineffective, for in the *Bromeliaceae* fully two-thirds of the herbarium specimens lack well preserved corolla or genitalia.[2] This fact is easily understood when one realizes that plants so highly adapted to an epiphytic life are little, if at all, affected by being put into press, simply completing their life-cycle and going to seed. Only by cutting off individual flowers or by very rapid heat-drying can one hope consistently to make specimens that show flowering characters, and such technique has been used but rarely.

However, the determination of fruiting *Tillandsieae* is not so hopeless as it might appear, and by no means in the same category as that of most members of the *Orchidaceae* when in fruit. Three very important groups of characters, based on the general habit, floral bracts, and sepals, still remain, and there are many instances where one of these alone is sufficient to identify a species. The habit of *Tillandsia usneoides*, the floral bracts of *Vriesea erythrodactylon* and the sepals of *Tillandsia tetrantha* are cases in point.

With this situation in mind it has been found possible to evolve a treatment based on the persistent parts of the plant which makes the

[1] Bromeliaceae Mez, in Monographiae Phanerogamarum, De Candolle ix. (1896).

[2] In September, 1927, of the 778 mounted sheets of the Tribe *Tillandsieae* in the Gray Herbarium only 262, or somewhat less than 34 per cent, had corollas that showed structure or relation to stamens and pistil at all clearly. More recently examined collections of this group in the United States National Herbarium, the herbarium of the New York Botanical Garden, and in various herbaria in Brazil and Europe, while not actually counted appeared to have about the same proportion of imperfect material.

identification of fruiting material much easier without losing any of the effectiveness of the older treatments in the case of flowering material. The combination of superior ovary, plumose seeds, and entire leaves readily distinguishes a mature specimen of the *Tillandsieae* from members of any of the other tribes of *Bromeliaceae*. This treatment follows the generally accepted division of the *Tillandsieae* into the six genera: *Tillandsia, Vriesea, Catopsis, Sodiroa, Guzmania,* and *Thecophyllum*,[1] but in keying places the emphasis primarily upon species. The exclusion of corolla- and genitalia-characters from the main headings necessitates the joint keying of species from different genera, when, as in *Tillandsia* and *Vriesea,* there is close similarity in habit. However, the remaining genera may be keyed in entirety without undue complication by means of this system, and even in *Tillandsia* whole sections can be so distinguished.

The present system has a distinct advantage over former ones in that it largely eliminates errors involved in guessing the systematic position of a species known only from fruiting material. For instance, a new species if in fruit, may be assigned to the wrong section of *Tillandsia* or *Vriesea* in an attempt to fit it into the old style of key. Then later on when further specimens show the true structure of the flower or are collected a long distance from the type locality, the first material is overlooked and the later named as a second species, with consequent confusion and useless synonymy. In such cases it is clearly preferable to have an obvious distinction between species and to eliminate synonyms, leaving the determination of exact relationship between species until good flowering material is collected. *Tillandsia capitata* Griseb., *T. attenuata* Rusby, and *T. spuria* Mez are good examples of species that can not be handled properly except by the new system, and the case of *T. subimbricata* Bak. and its synonym *T. orthorhachis* Mez & Bak. (see p. 15) is an example of the duplication of names that might be so avoided.

Wholly aside from the question of a new method of treatment, there is great need of a revision of the *Tillandsieae* simply to correlate the large amount of new material and publications which has appeared since Mez's monograph in 1896. In *Tillandsia* alone the 248 species treated by Mez's work have been increased by upwards of one hundred and twenty, largely by Mez himself. Most of the new collections in European herbaria seem to have been thoroughly covered by Mez in his later publications, if not embodied in a new general treatment.

[1] Treated by Mez as a section of *Guzmania* in his monograph, but later raised to generic rank on the basis of discoveries in regard to corolla structure (Mez in Bull. Herb. Boiss. ser. 2, iii. 130 (1903)).

On this side of the water, however, much important material has lain unstudied, and it is one of the principal objects of this paper to record such new and noteworthy facts as this material brings to light. As in most systematic work, new material of the *Tillandsieae* affects old treatments in two ways. From time to time indisputable novelties appear in new collections or are definitely established by a closer study of the old material as in the case of *T. commixa* Mez. But new material also tends to show intermediate forms between what were formerly considered distinct species, forcing one either to draw the specific concept so exceedingly fine that it can not be followed readily, or else to merge the species in question into one.

Material in American herbaria has in many cases shown old specific lines to be untenable on any reasonable basis, as in the case of the species centering about *Tillandsia tetrantha* R. & P. and *T. adpressa* André. Early collections of this group were scanty and from widely separated regions, easily giving rise to the idea that a number of different species were involved. The majority of these supposed species were reduced to synonymy by Mez, and now the study of Macbride's Peruvian material and Standley's Central American shows that only the two already mentioned and *T. Fendleri* (Bak.) Mez can be distinguished, and even *T. Fendleri* not very satisfactorily.

It is only to be expected that the majority of species of *Tillandsieae* should be wide-ranging and only restricted by large bodies of salt water or strong differences in climate, since their epiphytic habit renders them independent of soil conditions and their plumose seeds provide them with a very rapid and effective means of dispersal. Indeed it is more than likely that the restricted ranges of many species as we now know them are rather an expression of restricted collecting, for the area involved has been but scantly worked compared to the north temperate regions and the difficulty of preparation makes the *Tillandsieae* a group shunned by the general collector. One of the most striking pieces of evidence in support of this idea is the case of *Tillandsia monadelpha* (Morr.) Bak. known only from the Guianas at the time of Mez's monograph but now recorded around the southern Caribbean into Guatemela and down the Andes into Ecuador.

Such novelties as are here recorded are species found near the geographic centers of their respective groups, where they would in general be most likely to appear.

In preparing the present article the greater part of the work has been done at the Gray Herbarium between 1926 and the present time. I am greatly indebted to Dr. B. L. Robinson for his direction throughout and many helpful suggestions for improving the form of

the paper. Dr. I. M. Johnson has my sincerest thanks for suggesting this interesting line of research in the first place and for procuring photographs of critical material in European herbaria and otherwise aiding my study of the group.

I have visited the herbaria of the United States National Museum and the New York Botanical Garden to study their material of *Bromeliaceae* and have had loans for critical study from them and the Field Museum of Natural History through the kindness of those in charge. I am pleased to acknowledge the courtesy shown me by Dr. H. A. Gleason of the New York Botanical Garden in sending critical notes on material in the Kew Herbarium and in bringing to my attention important new material from British Guiana. Mr. Paul C. Standley's ample material from Central America has been of great help in determining specific values in various cases, and Mr. J. Francis Macbride's Peruvian collections have cleared up dubious points on Ruiz & Pavon species and their near relatives.

More recently I have had the opportunity to visit eastern Brazil to study and collect. This expedition was made possible by the grant of a Sheldon Travelling Fellowship and I sincerely thank the members of the Sheldon committee for their generosity. While in Brazil I visited several herbaria and government biological stations, and the courtesy and hospitality extended by Dr. P. Campos Porto of the Ministry of Agriculture and the Botanic Garden of Rio de Janeiro, by Dr. F. C. Hoehne of the Biological Institute of São Paulo and by Dr. J. Cesar Diogo and Mr. A. C. Brade of the National Museum of Rio de Janeiro are gratefully acknowledged.

Later in 1929 I visited various European herbaria to examine and photograph critical specimens of *Bromeliaceae*. Permission to study the specimens in their charge was kindly accorded me by Prof. J. Briquet of the Conservatory of Botany at Geneva, Dr. G. Beauverd of the Barbey-Boissier Herbarium, Mr. James Dandy in charge of the Monocotyledons at the British Museum, and Dr. A. W. Hill, Director of the Royal Botanic Gardens at Kew.

In the course of my introductory studies of the *Bromeliaceae*, several cases of range extension, needful changes in synonymy, undescribed novelties and other taxonomic matters have been brought out and it seems best to put them promptly on record rather than to wait until the genus including each case is revised. For the sake of clarity all novelties and new combinations made necessary by the revision of the section *Pseudo-Catopsis* of *Tillandsia* in the latter part of this paper are put on formal record in this general article.

Billbergia viridiflora Wendl. in Otto & Dietr. Gartenz. xxii. 154 (1854), as *Bilbergia*.

BRITISH HONDURAS: Rocky wooded hill, Toledo, April 10, 1907, *M. E. Peck 834* (G).

This new station for the species is particularly noteworthy since it is the first record outside Brazil, its type locality (according to Mez) and the geographical center of *Billbergia*. Whether there was an error in the record of the type locality, as is very possible in a species described from horticulture, or whether the species is actually of such wide range can not be determined until further material has been collected.

Guzmania Altsonii, spec. nov., epiphyta, acaulis, 1 m. alta vel ultra: foliis 5 dm. longis; lamina lingulata, acuta, 4 cm. lata: scapo valido, erecto, bracteis foliaceis induto: inflorescentia laxe bipinnata, 6 dm. longa, fere 2 dm. lata; bracteis primariis late ovatis, acuminatis, spicis axillaribus multo brevioribus: spicis densis, anguste ellipticis, 6 cm. longis, 2 cm. latis, valide ad 1–4 cm. stipitatis, basi bracteis sterilibus auctis: bracteis floralibus late ellipticis, 2 cm. longis, sepala aequantibus, obscure punctulatis, apice valde nervatis, dense imbricatis: floribus 3 cm. longis, erectis, albis; sepalis anguste ellipticis, 15 mm. longis, carinatis. Pl. I, fig. 1.

BRITISH GUIANA: Essequibo: Kaietur Plateau, Potaro River, 1926, *Altson 551* (Kew, TYPE; phot. G).

This species is closely related to *G. Splitgerberi* Mez, from which it is distinguished by the much smaller size of the flowers.

Navia Gleasonii, spec. nov., brevissime caulescens: foliis linearibus, 20 cm. longis, 5 mm. latis, primo aspectu inermibus, basi pauce minuteque dentatis, glabris: inflorescentia capitata, foliorum crateri centrali immersa; bracteis primariis ovato-oblongis, inermibus, ferruginis: floribus 2 cm. longis, albis; sepalis 1 cm. longis, ad 7 mm. connatis; ovario 3 mm. longo, anguste ellipsoideo. Pl. I, figs. 2–3.

BRITISH GUIANA: Maceba Falls, Karatung River, 1925, *Altson 338* (Kew, TYPE; phot. G).

I am indebted to Dr. H. A. Gleason of the New York Botanical Garden for bringing this new species to my attention.

Puya Quelchii (N. E. Brown), comb. nov. *Connellia Quelchii* N. E. Brown, Trans. Linn. Soc. ser. 2, vi. 67, t. 14 (1901). *Tillandsia stricta* var.?, Bak., ibid. ser. 2, ii. 285 (1887). *Puya Augustae* Mez in DC. Mon. ix. 487 (1896) in part (*im Thurn 315*). *P. roraimae* Mez in Fedde, Rep. Spec. Nov. xii. 417 (1913).

BRITISH GUIANA: Essequibo: Summit of Mt. Roraima, alt. 2600 m., *im Thurn 315* (hb. Jenman); *McConnell & Quelch 107* (Kew, fide N. E. Brown), *672* (hb. Jenman). Rocky slopes of Mt. Roraima, alt. 2400 m., 1910, *Ule 8557* (Berlin, type of *P. roraimae*, fide Mez).

In erecting the new genus *Connellia*, N. E. Brown says "from *Puya* it differs in habit, in the petals not twisting when the flower fades, in the capsule not dehiscing loculicidally and in the seeds." It is quite evident from the form of the above contrast that Brown was interpreting the genus *Puya* in accordance with the definition in Baker's *Bromeliaceae*. However, the limitation of *Puya* given by Mez in De Candolle's Monographiae seems on the whole much more natural and with this definition *Connellia* shows no real contrast. Habit is scarcely a good generic character, especially when nothing definite is specified, nor is the action of the petals on drying usually considered of more than sectional value in the family. The dehiscence of the capsule is not a good character as some species of *Puya* show a combination of loculicidal and septicidal dehiscence, and the illustration under *Connellia Augustae* shows an evident though narrow lateral wing to the seed. Consequently *Connellia* can scarcely be considered other than as a synonym of *Puya*. As *C. Quelchii* is evidently a good species the new combination of *Puya Quelchii* becomes necessary.

At the same time it should be noted that Mez overlooked the previous publication of *C. Quelchii* when he published *Puya roraimae*. The descriptions of both are so clear and detailed and are so closely alike that there can be no doubt of the two species being identical.

Tillandsia adpressa André var. **Tonduziana** (Mez), comb. nov. *T. Tonduziana* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 9 (1901). *T. Schumanniana* Mez in DC. Mon. ix. 740 (1896). *Catopsis Schumanniana* Wittm. in Engl. Bot. Jahrb. xi. 70 (1889). Careful comparison of the descriptions of *T. adpressa*, *T. Tonduziana* and *T. Schumanniana* and a later examination of the types of *T. adpressa* and *T. Schumanniana* show no more than a varietal difference between the first and second, and no real difference at all between the second and third. The shortness of the scape and inflorescence compared to the leaves in *T. Schumanniana* does not seem a good specific character, especially when its original author said that most of the flowers of the type specimen were spoiled by ants.[1]

Yet the short scape is the only character to distinguish *T. Schumanniana* and *T. Tonduziana*, since the character of a ferruginous-lepidote inflorescence given by Mez for the former breaks down entirely in a series of Costa Rican specimens. These plants show all gradations between deep ferruginous and very pale hyaline scales on the inflorescence and all agree very closely with the description of *T. Tonduziana*. Consequently no satisfactory distinction remains for the three species except the erect character of the branches in *T. adpressa* and this seems scarcely of more than varietal value.

[1]Wittm. in Engl. Bot. Jahrb. xi. 71 (1889).

In making the varietal name it seems best to pass by the specific name of *Schumanniana*, since it was founded on an abnormal plant, and use the first name applied to a normal plant, *Tonduziana*.

Var. **orthiantha** (Standl.) comb. nov. *T. orthiantha* Standl. in Journ. Wash. Acad. Sci. xvii. 248 (1927). This plant seems to be a dense-flowered variety of *T. adpressa*, closely paralleling the case of *T. tetrantha* var. *densiflora*.

Tillandsia chontalensis Bak. Several specimens from the U. S. National Herbarium, labelled *Tillandsia spuria* Mez, show a type of corolla structure very unusual in *Tillandsia*, that is petals with incised margins and with lateral folds enclosing the filaments. The co-type of *T. chontalensis* in the British Museum shows the same incised petals though this has not been noted by Baker or Mez, so that it seems best to cite these specimens under *T. chontalensis*:

NICARAGUA: near Chontales, 1867–8, *Tate 413* (Kew, TYPE; Br. M, phot. G). COSTA RICA: SAN JOSÉ: San Jeronimo, alt. 1500 m., 1909, *P. Biolley f. 17369* (US); CARTAGO: El Muñeco south of Navarro, alt. 1400 m., 1924, *Standley 33804*, *Standley & Torres 51781* (US).

Close comparison of the descriptions of *T. chontalensis* and *T. spuria* reveals only minor differences, such as occur within the limits of many of the better known species of *Tillandsia*. Therefore it seems very probable that *T. spuria* is a synonym of *T. chontalensis*, although this can not be certain until the type of *T. spuria* has been seen. Until then it seems best to assign all specimens of this group with lacerate petals to *T. chontalensis*. Pl. III, figs. 5–7.

Tillandsia crenulipetala Mez in Fedde, Rep. Spec. Nov. xvi. 76 (1919). *T. attenuata* Rusby, Desc. So. Am. Pl. 4 (1920). Pl. III, figs. 3–4.

COLOMBIA: MAGDALENA: Santa Marta, 1898–1901, *H. H. Smith 2349* (G, type collection); forest near Manganazes, alt. 1000 m., 1898–99, *H. H. Smith 2857* (NY, type of *T. attenuata*).

T. attentuata is based upon a single immature plant, yet its habit is so peculiar and so exactly resembles that of *T. crenulipetala* that there is little doubt that the two species are identical. The close proximity of the two collections would strengthen this conclusion.

T. crenulipetala belongs in the section *Allardtia* and its digitate inflorescence and incised petals argue a close relationship to *T. chontalensis*.

Tillandsia cylindrica Wats. Proc. Am. Acad. xxvi. 155 (1891). *T. Langlasseana* Mez, Bull. Herb. Boiss. ser. 2, iii. 142 (1903). Pl. III, figs. 1–2.

MEXICO: Guanajuato: near Guanajuato (?), *A. Dugès* (G, type). Michoacan or Guerrero (?): Las Seneguias, alt. 1520 m., 1898, *Langlassé 31*[1] (G, type collection of *T. Langlasseana*).

For some reason Mez failed to treat *T. cylindrica* in his monograph of the *Bromeliaceae* or in later papers. However, the type specimen of *T. cylindrica* corresponds with the description of *T. Langlasseana* and with the specimen which presumably belongs to its type collection.

Tillandsia (§ **Platystachys**) **Hitchcockiana**, spec. nov., fere metralis: foliis haud bulbose rosulatis, 4 dm. longis, utrinque dense ferruginascenti-incanis lepidotis; basi in vaginam maximam, ovalem, ferrugineam dilatatis; super vaginas ad 35 mm. latis inde in apicem acutum sensim angustatis: scapo glabro, sulcato, arcuatim decurvo, valido, vaginis ellipticis, lepidotis, internodia optime superantibus, infimis longe laminatis dense involuto: inflorescentia pendula, subdigitata e spicis 6–7: bracteis primariis ellipticis, late acutis, haud ultra 4 cm. longis: spicis subaequalibus, anguste oblongis, 25–35 cm. longis, ob bracteas patulas 2 cm. latis; spicarum rhachibus glabris sulcatisque, leviter undulatis, angulatis, angulis ad flores in alas angustas productis; bracteis florigeris imbricatis sed axin paulo obtegentibus, submembranaceis, glabris sulcatisque, ad 28 mm. longis, quam sepala distincte brevioribus, fere omnibus ad apicem versus valde recurvo-patulis: floribus fere erectis, 4 cm. longis, 1 cm. distantibus, breve (3 mm.) stipitatis; sepalis liberis, haud carinatis, 21 mm. longis; petalis purpureis (ex Hitchcock), quam stamina brevioribus, basi callis binis verticalibus praeditis; antheris anguste linearibus, quam filamenta vix latioribus, 8 mm. longis; filamentis undulatis; stylo perlongo; ovario 8 mm. longo: fructo ignoto. Pl. IV, figs. 2–5.

ECUADOR: Loja: between El Tambo and La Toma, alt. 1000–2200 m., 1923, *A. S. Hitchcock 21323* (G, type; US, cotype).

This beautiful and striking species is related to *T. incurva*, *T. cereicola* and *T. patula*, and the close resemblance of its inflorescence to that of *T. subimbricata* would argue that the latter species, though its flowers are as yet unknown, probably belongs to the section *Platystachys* also. *T. Hitchcockiana* is easily distinguishable from its near relatives by the combination of densely furfuraceous-lepidote leaves and of floral bracts shorter than the sepals. The recurved-spreading character of the floral bracts is of very doubtful importance as a specimen (*Fendler 1524*) of *T. incurva* in the Gray Herbarium shows both incurved and recurved floral bracts on the same spike, yet its strongly spreading-tipped bracts are the most striking single feature

[1] From a note on the label ("rosette 30 épis 31") it seems evident that *Langlassé 30* is also *T. cylindrica* although that number was not seen.

of *T. Hitchcockiana*. The species is unusual in having two lateral folds on each petal, a rare occurrence in *Tillandsia*.

Tillandsia (§ **Allardtia**) **Macbrideana**, spec. nov., foliis caulem elongatum furcatumque dense vestientibus, dense adpresseque lepidibus micantibus; vaginis late ellipticis, fere orbicularibus; laminis a vaginis vix distinctis, triangularibus acuminatisque, recurvatis: scapo aut minimo aut nullo: inflorescentia simplicissima, disticha, 5–10-flora, lanceolata, 4 cm. longa, 1.5 cm. lata, rosea; rhachi glabra sulcataque, angulata, floribus recipiendis valde excavata; bracteis laxe imbricatis, lanceolatis, ad 2 cm. longis, sepala distincte superioribus, ecarinatis, medium usque valde impressis, sulcatis, submembranaceis, primo dense adpresseque incanis-lepidotis, mox glabratis: sepalis anguste lanceolatis, valde carinatis, glabris sulcatisque, posticis inter sese ad 5 mm. connatis; petalis pulchre roseis, 25 mm. longis; staminibus quam stylum paulo superioribus, e fauce corollae emergentibus, antheris angustissimis, 7 mm. longis; ovario 3 mm. longo, ovoideo: fructo ignoto. Pl. II, figs. 1–3.

PERU: HUANUCO: on eastern face of rock cliffs, Llata, alt. 2100 m., 1922, *Macbride & Featherstone 2258* (FM, TYPE; G, COTYPE).

In its branched and trailing habit and in its lack of scape this species is strongly suggestive of *T. caulescens*, but its inflorescence is much shorter and broader closely resembling that of *T. complanata* and its leaf-blades are broadly triangular instead of nearly linear as in *T. caulescens*. Its most peculiar feature is the combination of a distichous spike with a style shorter than the stamens, thus combining characters of the sections *Allardtia* and *Anoplophytum*. However, it seems most closely allied to species which definitely belong to *Allardtia*, so I am tentatively placing it there.

Tillandsia (§ **Pseudo-Catopsis**) **membranacifolia**, spec. nov., acaulis, semimetralis: foliis rosulatis, 25 cm. longis, pertenuibus, fere membranaceis; vaginis late ellipticis, dense lepidibus minutissimis brunneis obtectis; laminis loratis, 45 mm. latis, apice rotundatis apiculatisque, lepidibus incanis obtectis, sed ut videtur glabris: scapo erecto, glabro, dense vaginis ellipticis apiculatis pallide adpresseque lepidotis, internodia superantibus obtecto, foliis breviori: inflorescentia laxe disticha, bipinnatim paniculata, ovata, 30 cm. longa, 12 cm. lata; axi recto, complanato, bicanaliculato, fere glabro; bracteis primariis parvis, vix ultra 15 mm. longis, ovato-acutis, patulis vel reflexis: spicis subdense 23-floris, patulis, paulo arcuatis, ad 70 mm. longis, 6–10 mm. latis (sine capsulis), inferioribus longe stipitatis, basi bracteis sterilibus auctis; rhachi undulata, valde complanata, angulata, floribus re-

cipiendis excavata, pallide parceque lepidota; bracteis florigeris late ovatis, navicularibus, sepalis paulo sed constanter brevioribus, ecarinatis, medium usque impressis, laevibus, parce lepidotis: sepalis liberis, asymmetrico-obovatis, haud ultra 5 mm. longis, retusis, basin versus carinatus, laevibus; petallis et partibus genitalibus ignotis: capsulis anguste cylindricis, apiculatis, ad 18 mm. longis. Pl. II, figs. 4–7.

COLOMBIA: SANTANDER: epiphytic, woods, Mesa de los Santos, eastern Cordillera, alt. 1500 m., 1926, *E. P. Killip & Albert C. Smith 15067* (G, TYPE).

This species is most nearly related to *T. Michelii* Mez, but is distinguished from it by its spreading or reflexed primary bracts, its imbricated scape-bracts and the extremely thin texture of its leaves. Its general habit is also very suggestive of relationship with *T. spiculosa* but there the floral bracts are always at least equal in length to the sepals.

Tillandsia monadelpha (Morr.) Bak., Journ. Bot. xxv. 281 (1887). Formerly this species was known definitely from only Surinam and British Guiana, but recent collections chiefly by various American botanists, notably Standley, have shown that it is of much wider distribution, extending from Surinam around the southern and western Caribbean into Guatemala, and down the Andes into Ecuador. The following citations are noteworthy:

BRITISH HONDURAS: Middlesex, alt. 65 m., 1929, *W. A. Schipp 390* (G). GUATEMALA: ALTA VERAPAZ: Finca Trece Aguas, alt. 300 m., 1907, *G. P. Goll 117* (US). HONDURAS: ATLÁNTIDA: Lancetilla Valley, near Tela, alt. 20–600 m., 1928, *Standley 54811* (G). COSTA RICA: GUANACASTE: El Silencio, near Tilarán, alt. 750 m., 1926, *Standley & Valerio 44783* (US); El Arenal, alt. 485–600 m., 1926, *Standley & Valerio 45123* (US); Los Ayotes, near Tilarán, alt. 600–700 m., 1926, *Standley & Valerio 45601, 45611, 45626* (US); La Tejona, north of Tilarán, alt. 600–700 m., 1926, *Standley & Valerio 46031* (US); Quebrada Serena, southeast of Tilarán, alt. 700 m., 1926, *Standley & Valerio 46263* (US, phot. G). CARTAGO: vicinity of Pejivalle, alt. 900 m., 1926, *Standley & Valerio 47236* (US). LIMON: La Colombiana Farm of the United Fruit Co., alt. 70 m., 1924, *Standley 36827, 37310* (US); Finca Montecristo, on the Rio Reventazón below Cairo, alt. 25 m., 1926, *Standley & Valerio 48946, 48993* (US). LIMON or CARTAGO (?): Baguar, 1874, *O. Kuntze 2009* (US). PANAMA: CANAL ZONE: hills around the Agua Clara Reservoir, near Gatun, alt. 20–30 m., 1911, *H. Pittier 2658* (US); Barro Colorado Island in Gatun Lake, alt. 120 m. or less, 1925, *Standley 41169* (US). COLOMBIA: EL VALLE: Dagua Valley, Santa Rosa, alt. 200–300 m., 1922, *Killip 11532* (G, NY). ECUADOR: indefinite, *H. Eggers 15252* (Kew; phot. G). BRITISH GUIANA: NORTHWEST DISTRICT: short cut Waini River, 1906, *J. E. Becket 8521* (NY); Mt. Everard, 1922, *Cruz 1301* (NY); Amakura River, lat. 8° 10′ N., long. 60° W., 1923, *Cruz 3562* (G, NY); Yarikita Police Station, junction of Yarikita and Amakura Rivers, 1920, *Hitchcock 17636* (G). RUPUNUNI DISTRICT: upper Rupununi River, near Dadanawa, lat. 2° 45′ N., 1922, *Cruz 1539* (NY).

Tillandsia multiflora Benth., Bot. Sulph. 174 (1844). The relative lengths of the primary bracts and the axillary branches in this species vary over a rather wide range and the proportions of the leaf are correlated with those of the primary bracts. Yet specimens present such a fine gradation that the groups do not appear to be of greater than varietal rank.

Var. **typica**, foliis 3 dm. longis; lamina 10 mm. lata, angustissime triangulari, longe caudata: scapi bracteis omnibus quam internodia multo longioribus, omnibus longe caudatis: bracteis primariis elongate lanceolatis, acuminatis, infimis maturitate ramulos axillares superantibus.

Var. **decipiens** (André), comb. nov. *T. decipiens* André, Rev. Hort. lx. 567 (1888).

Var. **tomensis**, var. nov., foliis 26 cm. longis; lamina lata, elongate lanceolata, acuta vel brevissime acuminata: scapi bracteis internodiis aequantibus vel paulo superantibus, supremis apiculatis, infimis breve caudatis: bracteis primariis late lanceolatis, apiculatis, ramulis axillaribus multo brevioribus. Pl. V, figs. 1–4.

ECUADOR: Loja: between El Tambo and La Toma, alt. 1000–2200 m., 1923, *Hitchcock 21375* (G, TYPE).

Tillandsia (§ **Pseudo-Catopsis**) **pugiformis** spec. nov., epiphyta (ex Hitchcock), breviter caulescens, 10-12 dm. alta: foliis ad 20, rosulatis, 4 dm. longis, utrinque lepidibus minutis peradpressisque dense praeditis, paulo purpureo-maculatis, basi in vaginam magnam ferrugineam dilatatis; lamina (super vaginam) pugiformi, ad 25 mm. lata inde in apicem peracutum sensim angustata, cinereo-viridi: scapo erecto, gracili, glabro, foliis duplo longiore; nodis violascentibus; scapi bracteis anguste ellipticis dense lepidotis, supremis acutis vel apiculatis, internodiis brevioribus, infimis longe caudatis, quam internodia longioribus: inflorescentia laxissima, tripinnatim paniculata, disticha, 4 dm. longa; axibus pallide parceque lepidotis; bracteis primariis anguste lanceolatis, vix ultra 2 cm. longis, dense pallideque lepidotis: spicis gracillimis, ad 14 cm. longis, laxissime ad 23-floris, distichis, saepe longe stipitatis, basi bracteis sterilibus uno vel pluribus auctis; bracteis florigeris distincte nervatis, ovato-acutis, navicularibus, haud vel vix carinatis, lepidotis, 4–5 mm. longis, sepalis aequantibus: floribus erectis, rhachi adpressis, 6 mm. longis, internodiis plerumque aequantibus vel brevioribus; sepalis liberis, asymmetrico-obovatis, lepidotis, rotundatis apiculatisque; petalis aureis (siccatis), sepalis minute superioribus; staminibus styloque inclusis: capsulis ignotis. Pl. I, figs. 4–7.

ECUADOR: AZUAY: between Oña and Cuenca, alt. 2700–3300 m., 1923, *Hitchcock 21586* (G, TYPE; US, COTYPE).

This species is more closely allied to *T. tenuispica* André than to any other known species, but is readily distinguishable by its narrowly triangular leaf-blade and somewhat caulescent habit.

Tillandsia Seemanni (Bak.) Mez var. **Mezii** (André), comb. nov. *T. Mezii* André in DC. Mon. ix. 738 (1896). *Caraguata pulchella* André in Rev. Hort. lx. 565 (1888). This plant differs from typical *T. Seemanni* in only its acaulescent habit and scantly lepidote scape, consequently it is of not greater than varietal rank and additional collections may show that it merges indistinguishably with the type material.

Tillandsia (§ **Pseudo-Catopsis**) **sinuosa,** spec. nov., acaulis, fere 6 dm. alta: foliis rosulatis, ad 23 cm. longis, dense adpresseque punctulato-lepidotis, basi in vaginam ovatam, bruneam dilitatis, laminis anguste triangularibus, longe acuminatis, 20 mm. latis: scapo erecto, gracili, vaginis anguste ellipticis, apiculatis, dense inbricatis induto: inflorescentia laxe tripinnata, 30 cm. longa, 12 cm. lata, fere glabra: bracteis primariis anguste lanceolatis, quam ramos axillares multo brevioribus: spicis anguste linearibus, 5 cm. longis, 5 mm. latis, laxe 14-floris, rhachi sinuosa, gracillima, pauce lepidota: bracteis florigeris erectis, ovato-acutis, 5–6 mm. longis, flores aequantibus, lepidotis, sulcatis, ad apicem versus carinatis, incurvis: floribus minutis, erectis; sepalis asymmetricis, anguste obovatis, apiculatis, lepidotis; petalis quam sepala minute longioribus, acutis, citrinis, punctulatis: stamina profunde inclusis, stylo longioribus, antheris ovoideis, apice minute mucronatis: capsula graciliter cylindrica, 2 cm. longa. Pl. II, figs. 8-12.

ECUADOR: LOJA: between El Tambo and La Toma, alt. 1000–2200 m., *A. S. Hitchcock 21358* (G, TYPE; NY).

Tillandsia spiculosa Griseb. var. **palmana** (Mez), comb. nov. *T. palmana* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 9 (1901). This plant differs from typical *T. spiculosa* merely by its not having the sterile bases of the axillary branches longer than the primary bract. So far all Costa Rican material examined belongs in the variety *palmana.*

Var. **Rothschuhiana** (Mez), comb. nov. *T. Rothschuchiana* Mez in DC. Mon. ix. 645 (1896). *T. Rothschuhiana* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 8 (1901). This plant likewise differs from typical *T. spiculosa* by its shorter sterile bases of the branches. It differs from var. *palmana* in having the summit of the leaf acute instead of rounded-apiculate.

Tillandsia subimbricata Bak. Journ. Bot. xxv. 304 (1887); Bak. Brom. 188 (1889); Mez in DC. Mon. ix. 776 (1896). *T. orthorhachis* Mez & Bak. Bull. Torr. Bot. Club. xxx. 435 (1903). Pl. IV, fig. 1.

TRINIDAD: *Botanic Gardens Herb. 2005* (US, phot. G). COLOMBIA: BOLIVAR: thickets, north of Arjona, alt. 30–50 m., 1926, *Killip & Smith 14530* (G). PANAMA: PANAMA: along Corozal Road, near Panama, 1923, *Standley 26837* (US); Rio Tapia, 1924, *Standley 28255* (US); near Punta Paitilla, 1923, *Standley 26254* (US).

T. subimbricata evidently should include in its synonymy the later *T. orthorhachis*. As both species were based on material lacking the stamens, their systematic position within the genus was necessarily a matter of guesswork. *T. subimbricata* being described from Trinidad, it seemed most likely that it should belong to the subgenus *Allardtia*, while *T. orthorhachis* being described from Central America which is the center of the subgenus *Platystachys*, was quite naturally thought to belong there. Yet no good distinguishing character can be found between the two species.

Tillandsia tetrantha R. & P. The plate of *T. tetrantha* in Ruiz and Pavon's Flora Peruvian agrees quite closely with the species which has been going under the name of *T. aurantiaca*, but fails to show any floral bracts, nor is any mention made of them in the description. This is significant in view of the fact that some notice is taken of the floral bracts in nearly every other species of *Tillandsia* mentioned by Ruiz and Pavon, and that Macbride's specimen, found less than fifteen miles from the type locality of *T. tetrantha*, is the only specimen of this species group known to have minute floral bracts. This retypification necessitates the following transfers in this very variable species:

Var. **aurantiaca** (Griseb.), comb. nov. *T. aurantiaca* Griseb. in Goett. Nachr. 16 (1864).

Var. **densiflora** (André), comb. nov. *T. aurantiaca* Griseb. var. *densiflora* André, Rev. Hort. lx. 567 (1888).

Var. **scarlatina** (André), comb. nov. *T. aurantiaca* Griseb. var. *scarlatina* André, Rev. Hort. lx. 567 (1888).

Var. **miniata** (André), comb. nov. *T. aurantiaca* Griseb. var. *miniata* André, Rev. Hort. lx. 567 (1888).

2. SYNOPSIS OF THE TRIBE TILLANDSIEAE. PART 1, BEING A REVISION OF THE SECTION PSEUDO-CATOPSIS OF TILLANDSIA.

The following synopsis is an attempt to bring up to date the treatment of the Section *Pseudo-Catopsis* of *Tillandsia* and at the same time to start a general treatment of the tribe *Tillandsieae* which will

make possible the identification of fruiting specimens. The larger specimens of the section resemble the Section *Allardtia* in habit, but their extremely short pistil suggests nearer relation to the Section *Phytarhiza*. It has seemed best to limit the section to species with oblong or obovate sepals, thus making a more homogeneous group and excluding *T. Barbeyana* which seems to belong rather to *Allardtia*.

For the geographic distribution of the section *Pseudo-Catopsis* see Pl. V, fig. 6.

Key to Species

1. Spikes with flowers distichous or secund, or else the inflorescence reduced to a single flower.
2. Sepals asymmetric, free, oblong or broadest near the apex, not over 10 mm. long ..... *Tillandsia* § *Pseudo-Catopsis.*
3. Inflorescence simple or of a few closely aggregated spikes: floral bracts broad, usually membranaceous, twice as long as the sepals.
4. Leaves scarcely or not at all undulate-crisped.
5. Inflorescence pendulous, lax: floral bracts in no way concealing the rhachis. Colombia ..... 1. *T. trapeziformis.*
5. Inflorescence erect or nearly so, dense: floral bracts concealing the rhachis. Ecuador ..... 2. *T. Seemanni.*
4. Leaves distinctly undulate-crisped. Colombia, Ecuador, Peru ..... 3. *T. crispa.*
3. Inflorescence ample, pinnately panicled, or the floral bracts shorter than the sepals.
6. Flowers not at all secund.
7. Inflorescence definitely pendulous.
8. Flowers spreading, nearly or quite at right angles to the rhachis.
9. Bracts of the scape with long-caudate tips: primary bracts large, at least half as long as the spikes and often exceeding them.
10. Primary bracts oblong-lanceolate to narrowly ovate: leaf-blades narrow, not over 20 mm. broad at base, usually much less, their tips involute-rigid: sepals not over 5 mm. long. Costa Rica, Colombia, Brazil .... 34. *T. adpressa.*
10. Primary bracts broadly ovate: leaf-blades up to 50 mm. broad, usually flat: sepals up to 10 mm. long. Venezuela, Colombia, Ecuador, Peru ..... 36. *T. tetrantha.*
9. Bracts of the scape mostly acute or apiculate: primary bracts very small, rarely attaining the lowest flower of the spike.
11. Leaf-blade narrowly triangular, involute. British Guiana ..... 4. *T. Jenmani.*
11. Leaf-blade linear, usually flat. Peru .. 32. *T. parviflora.*
8. Flowers erect or ascending.
12. Leaf-blade narrowly triangular, not over 10 mm. broad at base, much crisped: panicle-branches erect or but slightly spreading: floral bracts much shorter than the sepals.
13. Spikes laxly flowered, the flowers up to 6 mm. apart: leaves purple-mottled: floral bracts acute. Brazil, Colombia ..... 5. *T. aerisincola.*

13. Spikes densely flowered, the flowers about 2.5 mm. distant: leaves not at all mottled: floral bracts obtuse. Costa Rica.....6. *T. contorta.*

12. Leaf-blade sub-lorate, but slightly narrowed from the sheath, 20–40 mm. broad at base, not at all crisped: panicle-branches almost at right angles to the axis: floral bracts about equaling the sepals. Antilles.....12. ***T. Lescaillei.***

7. Inflorescence erect or ascending.

14. Flowers strictly erect, closely appressed to the rhachis, remote: floral bracts mostly equaling or shorter than the internodes.

15. Leaf-blade lorate. Colombia.....7. *T. tenuispica.*

15. Leaf-blade narrowly triangular. Ecuador.8. *T. pugiformis.*

14. Flowers more or less spreading: floral bracts mostly longer than the internodes.

16. Floral bracts about equaling the sepals or distinctly longer.

17. Floral bracts over 10 mm. long.

18. Spike-rhachis very undulate: sepals 10 mm. long. Ecuador.....9. *T. inconspicua.*

18. Spike-rhachis slightly undulate: sepals 7 mm. long. Mexico.....10. *T. Ghiesbreghtii.*

17. Floral bracts less than 10 mm. long.

19. Floral bracts even or faintly few-nerved near the margin, without a midnerve.

20. Floral bracts almost exactly equaling the sepals, not conspicuously incurved at apex.

21. Primary branches of the inflorescence simple, 8.5–15 (rarely only 6)[1] cm. long.

22. Scape-bracts exceeding the internodes. Trinidad, British Guiana, Brazil, Bolivia.....11. *T. triticea.*

22. Scape-bracts shorter than the internodes. Antilles.....12. *T. Lescaillei.*

21. Primary branches of the inflorescence divided, or if simple not over 6 cm. long.

23. Spikes laxly flowered: flowers spreading not touching at maturity: floral bracts 4–5 mm. long. Trinidad, Venezuela.....13. *T. micrantha.*

23. Spikes densely flowered: flowers spreading only as far as necessary by the pressure of those above: floral bracts 6–9 (rarely 5) mm. long. Nicaragua, Costa Rica, Venezuela, Colombia, Bolivia..14. *T. spiculosa.*

20. Floral bracts definitely exceeding the sepals.

24. Floral bracts not at all incurved at apex: flowers nearly erect. Jamaica.
15. *T. Fawcettii.*

[1] *Nash & Taylor 1094* (NY), apparently an immature specimen of *T. Lescaillei.*

24. Floral bracts definitely incurved at apex: flowers spreading.
25. Leaf-blade lanceolate: inflorescence bipinnate. Ecuador.....16. *T. homostachya.*
25. Leaf-blade lorate: inflorescence tripinnate. Ecuador, Bolivia.17. *T. monticola.*

19. Floral bracts sulcate with a definite mid-nerve.
26. Primary bracts erect: branches arching-pendulous. Peru, Bolivia.....18. *T. pendulispica.*
26. Primary bracts spreading: branches not arching-pendulous.
27. Leaf-blade lorate. Ecuador..19. *T. quadripinnata.*
27. Leaf-blade narrowly triangular.
28. Flowers spreading: spikes oblong. Colombia.....20. *T. subalata.*
28. Flowers erect: spikes linear. Ecuador.....21. *T. sinuosa.*

16. Most of the floral bracts distinctly shorter than the sepals.
29. Primary branches arching-pendulous or reflexed: spikes densely flowered: leaf-blade rounded-apiculate.
30. Primary branches nearly straight, reflexed: primary bracts spreading or reflexed: scape-bracts imbricate. Colombia. 22. *T. membranacifolia.*
30. Primary branches arching-pendulous: primary bracts erect: scape-bracts remote. Colombia. .....23. *T. Michelii.*

29. Primary branches erect or spreading or if rarely reflexed then either the spikes laxly flowered or the leaf-blade triangular.
31. Inflorescence definitely tripinnate or more divided.
32. Floral bracts and sepals glabrous or sparingly pale-lepidote.
33. Inflorescence very large and much divided: spikes linear: flowers erect or nearly so. Galapagos Islands..24. *T. insularis.*
33. Inflorescence usually not more than tripinnate: spikes oblong, lanceolate or ovate: flowers more or less spreading.
34. Scape-bracts but slightly shorter than, or exceeding the internodes.
35. Floral bracts strongly sulcate. Ecuador.....25. *T. multiflora.*
35. Floral bracts even or faintly few-nerved.
36. Leaf-blade sub-lorate, 30 mm. broad. Peru.....26. *T. pallidoflavens.*
36. Leaf-blade linear, not over 5 mm. broad. Peru.....27. *T. Weberbaueri.*

34. Scape-bracts small, at least the upper ones less than half as long as the internodes.

37. Floral bracts sulcate: spike-rhachis flexuous to geniculate. Colombia.....28. *T. ropalocarpa.*
37. Floral bracts even: spike-rhachis nearly straight. Peru.....29. *T. commixa.*

32. Floral bracts and sepals densely ferruginous-lepidote.
38. Upper scape-bracts shorter than the internodes. Peru, Bolivia.....30. *T. flexuosa.*
38. Upper scape-bracts much longer than the internodes. Ecuador.....31. *T. tripinnata.*

31. Inflorescence not more than bipinnate.
39. Primary bracts quite small, covering only the sterile base or a few flowers of the axillary spike.
40. Spikes laxly flowered. Peru.....32. *T. parviflora.*
40. Spikes densely flowered. Costa Rica. 33. *T. guanacastensis.*

39. Primary bracts at least half the length of the axillary spikes.
41. Leaf-blades not over 20 mm. broad at base, usually much less, tip usually involute subulate: sepals 5 mm. long. Costa Rica, Colombia, Ecuador, Brazil.....34. *T. adpressa.*
41. Leaf-blades usually more than 20 mm. broad, usually flat throughout: sepals up to 9 mm. long.
42. Spikes 3–5- (rarely more-) flowered, distinctly stipitate. Venezuela, Hayti.....35. *T. Fendleri.*
42. Spikes about 10-flowered, subsessile. Venezuela, Colombia, Ecuador, Peru.....36. *T. tetrantha.*

6. All or nearly all of the spikes secund-flowered.
43. Flowers all turned upwards.
44. Inflorescence bipinnate only. Venezuela, Colombia, Ecuador, Peru.....36. *T. tetrantha.*
44. Inflorescence amply tripinnate. Ecuador....37. *T. rectiflora.*
43. Flowers all turned downwards.
45. Both bracts and flowers secund. Colombia...38. *T. pectinata.*
45. Bracts not at all secund.
46. Inflorescence tripinnate. Colombia.....39. *T. tristis.*
46. Inflorescence bipinnate. Ecuador.....40. *T. Riocreuxii.*

[2]. Sepals symmetric, or if slightly asymmetric, ovate or lanceolate, broadest near base.

[1]. Spikes polystichous-flowering.

1. **Tillandsia trapeziformis** Mez. 2 dm. high, acaulescent: leaves densely rosulate, 2 dm. long, not at all undulate, bearing minute appressed scales throughout but particularly on the back, dilated below into a large oval dark-ferruginous and densely dark-lepidote sheath; blade 23 mm. broad, narrowly triangular, sub-membranaceous, green-cinereous: scape much shorter than the leaves, recurving, slender,

[1] To be treated in later articles.

glabrous; scape-bracts elliptic, abruptly acute, tubular-inflated, enfolding and much exceeding the internodes, densely brown-lepidote, the scales closely appressed: inflorescence pendulous, simple, 8 cm. long, 3 cm. wide, distichous, lax; rhachis geniculate, bearing large subfloccose ferruginous scales; floral bracts 22 mm. long, sub-trapeziform, acute, much exceeding the sepals, not at all imbricated nor concealing the rhachis, ecarinate, densely covered with large ferruginous scales: flowers suberect, short-stipitate; sepals broadly elliptic, 12 mm. long, 9.5 mm. wide, the right side of each produced into a rounded wing slightly exceeding the apiculate summit, subcoriaceous, densely covered with large scales, the two posterior sepals obtusely keeled toward the base; petals, genitalia and mature capsule unknown.—Epiphytic; Colombia.—Mez in DC. Mon. ix. 737 (1896).

Type from Sierra Nevada of Santa Marta, Colombia, *Wagner*, in herb. Zurich. Not seen.

2. **Tillandsia Seemanni** (Bak.) Mez. 20 cm. high: leaves 10–15, densely rosulate, 10–15 cm. long, thin; sheath broadly ovate, dark brown, obscurely lepidote with very minute appressed scales; blade not over 8 mm. broad, narrowly triangular: scape distinctly shorter than the leaves, slender, erect; scape-bracts 2 or 3, suberect, suborbicular, auricled, clasping the scape, pale-lepidote, shorter than the internodes: inflorescence erect, straight or slightly curved, about equaling the leaves or somewhat longer, simple or sometimes of two spikes, dense, few-flowered; rhachis straight, ferruginous-tomentose, completely covered by the floral bracts; floral bracts imbricate, 14 mm. long, exceeding the flowers, broad with suborbicular base and subacute to apiculate apex, membranaceous, strongly nerved, appressed-pale-lepidote: flowers erect, almost sessile, 12–15 mm. long; sepals 9.5 mm. long, distinctly asymmetrical by a large wing, obtuse, submembranaceous, few-nerved, appressed-lepidote on back; petals overlapping, coherent, rounded at apex, slightly longer than the sepals, much longer than the stamens; ovary stout, subglobose.—Mez in DC. Mon. ix. 737 (1896).

a. Var. **typica**. Caulescent: scape densely covered (especially toward the summit) with spreading stellate-divided ferruginous scales, becoming glabrous.—Terrestrial; Ecuador.—*Guzmania Seemanni* Bak. Brom. 153 (1889). *G. Bulliana* Bak. Journ. Bot. xxv. 173 (1887), not André.

ECUADOR: Loja: Loja, 1847, *Seemann 898* (Kew, TYPE; phot. G).

b. Var. **Mezii** (André) L. B. Smith (see p. 14). Acaulescent: scape scantly lepidote.—Epiphytic; Ecuador.—*T. Mezii* André ex

Mez in DC. Mon. ix. 738 (1896). *Caraguata pulchella* André, Rev. Hort. lx. 565 (1888); André, Brom. André, 49, t. 16, fig. a (1889); Bak. Brom. 144 (1889).

ECUADOR: CHIMBORAZO: Cerro Santa Barbara, south of Riobamba, alt. 3500 m., 1875–6, *André 4502* (G, ISOTYPE).

3. **Tillandsia crispa** (Bak.) Mez. Acaulescent, 1–3 dm. high: leaves many, densely rosulate, finely appressed-lepidote throughout; sheath large, brown-lepidote; blade very narrowly triangular, undulate-crisped: scape erect or slightly curved, slender; scape-bracts elliptic, somewhat inflated, apiculate to finely caudate, appressed-lepidote: inflorescence of one or of several digitately arranged spikes: spikes oblong, densely 6–36-flowered, 3–8 cm. long, 1.5–2.5 cm. wide; rhachis pruinose, brown-lepidote; floral bracts 9–15 mm. long, distinctly exceeding the sepals, suborbicular, inflated-convex, chartaceous, lepidote: flowers erect or suberect, sessile; sepals 5–8 mm. long, broadly elliptic, ecarinate, coriaceous, sparingly lepidote or glabrous, even; petals exceeding the sepals, coherent; genitalia included.—Epiphytic; Colombia, Ecuador, Peru.—Mez in DC. Mon. ix. 739 (1896). *Guzmania crispa* Bak. Journ. Bot. xxv. 173 (1887); Bak. Brom. 153 (1889); Wittm. Engl. Bot. Jahrb. xi. 62 (1889). *T. undulifolia* Mez in DC. Mon. ix. 740 (1896). *T. plicatifolia* Ule, Verhandl. Bot. Ver. Brandenb. xlviii. 144 (1907).

COLOMBIA: ANTIOQUIA: forests above Amalfi, 1800–2000 m., 1884, Lehmann xxiii (Hb. Boiss., phot. G); NORTE DE SANTANDER: Ocaña, 1845, *Purdie* (Kew, TYPE; phot. G). ECUADOR: (?) Rio de St. Francisco, 1882, *Drake 306* (NY, Kew, phot. G); AZUAY: Yarilcay on the Rio Paute and the Rio Masar, alt. 1800–2300 m., *Lehmann 4921* (Berlin, TYPE of *T. undulifolia;* phot. G). PERU: LORETO: Cerro de Escalero, alt. 1400 m., 1903, *Ule 6665* (Berlin, TYPE of *T. plicatifolia;* phot. G).

4. **Tillandsia Jenmani** Bak. Acaulescent, less than 4 dm. high: leaves few in an ellipsoid-bulbous rosette, 12 cm. long, very densely pale-lepidote with minute closely appressed scales; the sheath 5–6 cm. long, broadly ovate-elliptical, dark violet on the inside especially toward the base; blade scarcely 6 mm. broad, narrowly triangular, with small purple spots at the base, involute: scape slender, curved, appressed-lepidote becoming glabrous, much exceeding the leaves; scape-bracts few, much shorter than the internodes, erect-clasping, elliptic, acute to long-caudate, membranaceous, lepidote: inflorescence pendulous, bipinnate, distichous, 16–18 cm. long; axis slightly flexuous, angled: spikes 7 cm. long, spreading almost at right angles, 8–10-flowered, with flowers 7 mm. apart, long-stipitate: primary bracts not over 1 cm. long, resembling the scape-bracts, clasping the base of the

spike but usually failing to reach the lowest flower: floral bracts 3 mm. long, mostly shorter than the sepals, ovate, subacute, nearly glabrous: flowers sessile, spreading; sepals about 5 mm. long; corolla and genitalia unknown: capsule 25–30 mm. long, cylindric; seeds 2.5 mm. long, fusiform, with white coma 21 mm. long.—Epiphytic; British Guiana.—Bak. Journ. Bot. xxv. 345 (1887); Brom. 194 (1889); Mez in DC. Mon. ix. 758 (1896).

BRITISH GUIANA: Essequibo: Kaietur Savanna, Potaro River, 1881, *Jenman 848* (Kew, type; herb. Jenman; phot. G.)

5. **Tillandsia aerisincola** Mez. Acaulescent, 3 dm. high: leaves 15–30, densely bulbose-rosulate, 15–20 cm. long, densely pale-lepidote with minute appressed scales, covered with dark violet or reddish brown often confluent spots; sheath nearly orbicular, about 4 cm. broad, submembranaceous; blade 8 mm. broad, almost linear, acuminate, coriaceous: scape slender, sometimes slightly geniculate, cinereous-lepidote, becoming glabrous; scape-bracts elliptical, clasping, the upper ones apiculate, the lower ones long-caudate, at least the upper ones shorter than the internodes, densely and finely appressed-pale-lepidote: inflorescence pendulous, 2–3-pinnate, narrow, much exceeding the leaves; primary bracts like the scape-bracts, clasping the base of the spike, not extending beyond the lowest flower: spikes laxly 10–15-flowered, 6–8 mm. wide, 40–80 mm. long, erect at maturity with slightly flexuous rhachis; floral bracts about half as long as the sepals, ecarinate, ovate, acute, densely and finely lepidote: flowers erect, or ascending, sesssile; sepals elliptical, nerved, sparingly lepidote, coriaceous; petals shorter than the sepals (Ule); genetalia included (Ule); capsule cylindric, 27 mm. or less long.—Epiphytic; eastern Brazil, Colombia.—Mez in DC. Mon. ix. 759 (1896). *Vriesea ? aerisincola* Mez in Mart. Fl. Bras. iii. pt. 3, 555 (1894). *Catopsis maculata* Morr. ex Bak. Brom. 155 (1889). *C. deflexa* Ule, Bericht. Deutsch. Bot. Gesellsch. xviii. 323, t. 10, fig. 1–6 (1900).—Pl. V, fig. 5.

COLOMBIA: Magdalena: Santa Marta, 1898–1901, *H. H. Smith 2346* (Kew; phot. G. Differs from the typical form by the abbreviated axes of its inflorescence and spikes and by the spreading character of the flowers, see Pl. V, fig. 5, but is definitely conspecific). BRAZIL: Federal District: near Rio de Janeiro, 1838, *Wilkes Expedition* (G); Rio de Janeiro: Therezopolis, *A. Frarao 11,523* (herb. Jardim Botanico, Rio de Janeiro); São Paulo: dense woods, Estacao Biologica, Alto da Serra, alt. 800–900 m., 1929, *Smith, Hoehne & Kuhlmann 1828, L. B. Smith 2018* (G).

Ule 4957 (Berlin) from Serra de Macahé, Nova Friburgo, Rio de Janeiro State, alt. 900–1100 m., although not examined is unmistakable from its plate published as type of *Catopsis deflexa*.

6. **Tillandsia contorta** Mez & Pittier. Acaulescent, 17 cm. high: leaves densely rosulate, forming a pseudo-bulb 6 cm. in diameter, convolute, subfistulose, very minutely appressed-lepidote (especially the younger leaves); sheath broadly ovate-elliptical, brown-lepidote, not at all violet-colored; blade 6 mm. wide, very narrowly triangular, more or less undulate-crisped, not at all spotted, canescent-lepidote: scape slender, decurved; scape-bracts tubular, shorter than the internodes: inflorescence pendulous, about equaling the leaves, 9 cm. long, 7 cm. wide, densely bipinnate; axis slender, at length glabrous; primary bracts very small, not attaining the lowest flowers of the spikes: spikes densely 14-flowered, the lower ones long-stipitate, suberect to spreading, 50 mm. long; floral bracts suberect, ovate, rounded at apex, much shorter than the sepals, rigid, nearly glabrous, distinctly convex: flowers suberect, sessile, scarcely more than 5 mm. long, 2.5 mm. apart; sepals free, asymmetric, broadly rounded, brown: capsule 8 mm. long, cylindric.—Epiphytic; Costa Rica.—Mez & Pittier, Bull. Herb. Boiss. ser. 2, iii. 224 (1903).

Costa Rica, near Tuis, *Herb. inst. phys.-geogr. Costar. 11376.* Not seen.

7. **Tillandsia tenuispica** André. 5 dm. to over 1 m. tall, acaulescent: leaves submembranaceous, attaining a length of 3 dm. and a width of 45 mm., soon glabrous, lorate: scape erect, glabrous, surpassing the leaves; scape-bracts about equaling the internodes or shorter, apiculate to short-caudate: inflorescence ample, tripinnate, distichous, 25–60 cm. long; axis and branches of the inflorescence glabrous; primary bracts short, not over 35 mm. long, narrowly lanceolate, apiculate, glabrous: spikes extremely narrow, flexuous, very loosely pinnate; rhachis of spike flexuous, glabrous, more or less angled; floral bracts acute, slightly keeled toward the apex, closely and evenly nerved except on the margin, about equaling the sepals and closely enfolding them: flowers strictly erect, closely appressed to the rhachis, not overlapping; sepals glabrous, nerved, emarginate-rounded, 4 mm. long; petals violet (fide André); genitalia unknown: capsule cylindric, 13–20 mm. long.—Terrestrial (?) and epiphytic, Colombia.—André, Rev. Hort. lx. 567 (1888); Brom. André, 71, t. 31, fig. a (1889); Bak. Brom. 195 (1889); Mez in DC. Mon. ix. 759 (1896).

COLOMBIA: El Valle or Caldas (?): arid region of the Valley of Cauca, between Cartago and Naranjo, alt. 980 m., *André 2414* (NY, isotype); Norte de Santander: open hillside, eastern Cordillera, western side of Culagá Valley, north of Labateca, alt. 1480–1550 m., 1927 *Killip & Smith 20523* (G).

The Killip & Smith specimen is less than half as large as the type material but is in no other way distinguishable from it.

8. **Tillandsia pugiformis** L. B. Smith (see p. 13). Short-caulescent, 10–12 dm. high: leaves about 20, rosulate, 4 dm. long, densely punctulate-lepidote throughout, slightly spotted with purple; sheath large, brown; blade narrowly triangular, 25 mm. broad, green-cinereous; scape erect, slender, twice as long as the leaves, glabrous; nodes tinged with violet; scape-bracts narrowly elliptic, densely lepidote, the upper ones acute or apiculate, shorter than the internodes, the lower ones long-caudate, longer than the internodes: inflorescence laxly tripinnate, distichous, 4 dm. long; axes scantly pale-lepidote; primary bracts narrowly lanceolate, scarcely 2 cm. long, densely pale-lepidote: spikes very slender, 14 cm. long, laxly 25-flowered, distichous, often long stipitate with sterile bracts at base; floral bracts distinctly nerved, ovate-acute, boat-shaped, scarcely or not at all keeled, lepidote, 4–5 mm. long, equaling the sepals: flowers erect, appressed to the rhachis, 6 mm. long, mostly equaling or shorter than the internodes; sepals obovate, lepidote, rounded-apiculate; petals yellow (in dried specimen), barely longer than the sepals; stamens and pistil included: capsule unknown.—Pl. I, figs. 4–7.

ECUADOR: AZUAY: between Oña and Cuenca, alt. 2700–3300 m., 1923, *Hitchcock 21586* (G, TYPE; US, ISOTYPE).

9. **Tillandsia inconspicua** André. Acaulescent, 2–3 m. high: leaves densely rosulate, 1 m. long, 7 cm. broad, loriform, apex cuspidate, rather soft and flexible, striate and punctate, soon glabrous: scape erect, pale-lepidote throughout; scape-bracts green or reddish, the lower short-acuminate, the upper acute: inflorescence pyramidal, bipinnate, distichous, lax, 60 cm. long; primary bracts ovate-acute, the lower ones 3 cm. long, sparingly lepidote: spikes about 20, spreading, 15-flowered, the lower ones 10 cm. long, lax, subsessile, bearing several sterile bracts at base; rhachis very undulate, strongly angled, lepidote; floral bracts nearly enclosing the rhachis at their bases, imbricated, 15 mm. long, much exceeding the sepals, obtuse at apex, keeled, slightly nerved, sparingly lepidote: flowers erect, nearly sessile; sepals 10 mm. long, obovate, obtuse, lepidote; corolla, genitalia and capsule unknown.—Epiphytic; Ecuador.—André, Rev. Hort. lx. 568 (1888); Brom. André, 74 (1889); Bak. Brom. 196 (1889); Mez in DC. Mon. ix. 748 (1896).

ECUADOR: PICHINCHA (?): Andes near Niebli, alt. ca. 2000 m., 1876, *André 3795* (Kew, TYPE; phot. G).

10. **Tillandsia Ghiesbreghtii** Bak. Acaulescent, 1 m. or more high: leaves densely rosulate, 5 dm. long, covered with very minute appressed dark-centered scales but appearing glabrous to the naked

eye, chartaceous in the dried specimens; sheath ovate, 5–6 cm. broad, densely punctulate-lepidote, brown; blade 3–4 cm. broad, elongate-triangular: scape erect, glabrous; scape-bracts ovate-elliptical, acute, with involute tip when dry, obscurely punctulate-lepidote, appressed, exceeding the internodes: inflorescence over 50 cm. long, 20 cm. wide, lax, distichous, bipinnate except for the lowest branches which are sometimes divided; primary bracts like the scape-bracts, rarely over 5 cm. long, usually much shorter: spikes arcuate-spreading, laxly 18-flowered, 15 cm. long or less, 1.5–2 cm. broad, usually bearing 1–4 sterile bracts at base; rhachis glabrous, sharply 4-angled, excavated next the flowers; floral bracts suberect, not at all imbricate nor concealing the rhachis at maturity, 12–15 mm. long, much exceeding the sepals and the internodes, ovate-elliptical, rounded at apex, ecarinate, even or very faintly nerved, glabrous, coriaceous: flowers subsessile; sepals 7–8 mm. long, elliptical, coriaceous, glabrous, very faintly nerved if at all; petals 2 mm. longer than the sepals, white or yellowish, abruptly spreading toward the apex, much exceeding the stamens; anthers deltoid-cordate, bifid at apex, 1 mm. long; style short: mature capsule unknown.—Mexico, state of Vera Cruz.—Bak. Brom. 206 (1889); Mez in DC. Mon. ix. 749 (1896).

MEXICO: Vera Cruz: Cosolapa, (Vera Cruz Canton?), 1922, *Purpus 8775* (G, US); Orizaba, *Botteri 1005, 1006* (G).

11. **Tillandsia triticea** Burch. Acaulescent, 4–7 dm. high: leaves few to several, rosulate, 2–3 dm. long, densely punctulate-lepidote throughout; sheath broadly ovate-elliptic, brown; blade loriform, 30–35 mm. broad, rounded-apiculate, usually with irregular dark purple mottling: scape erect, glabrous; scape-bracts narrowly ovate, apiculate, exceeding the internodes, densely punctulate-lepidote: inflorescence laxly bipinnate, distichous, 2–3 dm. long, 1–2 dm. broad, glabrous; primary bracts like the scape-bracts, spreading, much shorter than and enfolding the base of the spike: spikes 8.5–12 or even 15 cm. long, linear, flexuous, spreading, 1 cm. broad, often long-stipitate with several sterile bracts at base, 14–36-flowered; floral bracts broadly ovate, acute, 7 mm. long, equaling the sepals, convex, ecarinate, glabrous, coriaceous, even or faintly few-nerved, not imbricate; rhachis angled, flexuous: flowers suberect to spreading, normally 3–4 mm. apart, sessile; sepals obovate, glabrous, coriaceous, even; petals yellowish; stamens included, anthers cordate, mucronate at apex; pistil included, ovary broadly ellipsoid, style short: capsule 23 mm. long, narrowly cylindric.—Epiphytic; Trinidad, British Guiana, eastern Brazil, Bolivia.—Burch. ex Bak. Journ. Bot. xxvi. 42 (1888); Bak.

Brom. 205 (1889); Mez in Mart. Fl. Bras. iii. pt. 3, 616 (1894); Mez in DC. Mon. ix. 750 (1896). *T. Parkeri* Bak. Journ. Bot. xxvi. 42 (1888); Brom. 205 (1889). *T. viridis* Bak. Brom. 204 (1889); Mez in Mart. Fl. Bras. iii. pt. 3, 616 (1894). *Vriesea viridis* Morr. ex Bak. Brom. 204 (1889). *V. Luschnathii* Mez in Mart. Fl. Bras. iii. pt. 3, 555, t. 103 (1894).

TRINIDAD: Mt. Tocuche, 1920, *Britton, Coker & Rowland 1323 in part* (NY). BRITISH GUIANA: NORTHWEST DISTRICT: Anabisi River, 1922, *Cruz 1357* (NY); INDEFINITE: *Parker* (Kew, TYPE of *T. Parkeri;* phot. G). BRAZIL: BAHIA: forests of Rio Grongogy Basin, alt. 100–500 m., 1915, *Curran 137* (US); SÃO PAULO: swampy woods, Santos, Burchell *3217* (Kew, TYPE; phot. G); Alto da Serra, 1902, *Edwall* (Instituto Biologico, Sao Paulo); dense woods, Estacão Biologica, Alto da Serra, alt. 800–900 m., 1929, *Smith, Hoehne & Kuhlmann 1827* (G); PARANÁ: Tacarehy, 1925, *Dusén 17070* (G). BOLIVIA: INDEFINITE: *Bang 2301 in part* (G, FM).

12. **Tillandsia Lescaillei** Wright. Acaulescent, 6–11 dm. in length: leaves forming a basal rosette 6–10 cm. thick, all erect, 25–30 cm. long; sheath broad, elliptical, chestnut-brown, passing almost imperceptibly into the blade; blade evenly green, sub-lorate, 3–4 cm. broad: scape much surpassing the leaves, decurved; scape-bracts membranaceous, densely and finely pale-lepidote, apiculate, much shorter than the internodes and not wholly enfolding the scape: inflorescence pendulous at maturity, open, bipinnate and distichous, 25–55 cm. long, 10–20 cm. wide; primary bracts not over 25 mm. long, narrow, apiculate: spikes narrow, about 10 mm. wide, with flowers closely erect and usually densely pinnate (barely or not quite overlapping), 5–12 cm. long, often long-stipitate and bearing several sterile bracts at the base; rhachis somewhat flexuous; floral bracts 7–8 mm. long, about equaling the sepals, usually quite nerveless, soon glabrous, ecarinate: sepals rounded at apex; corolla and genitalia unknown: capsule cylindric, 18–23 mm. long.—Epiphytic; Greater Antilles.—Wright in Sauv. Fl. Cub. 167 (1873); Bak. Brom. 184 (1889); Mez in DC. Mon. ix. 884 (1896); Mez, Bull. Herb. Boiss. ser. 2, iii. 224 (1903).

CUBA: ORIENTE: Monteverde, near Yateras, 1858, *Wright 674* (G, TYPE); Camp La Gloria, south of Sierra Moa, 1910, *Shafer 8057* (NY, US, Kew); (?) La Prenda, 1920, *Hioram 4135* (NY). HAITI: road from Camp no. 1 to La Barrière Couchant, alt. 950 m., 1905, *Nash & Taylor 1094* (NY).

13. **Tillandsia micrantha** Bak. Acaulescent, 4 dm. high: leaves rosulate forming an ellipsoid pseudo-bulb, 3–4 dm. long, obscurely punctulate-lepidote throughout; sheath large, elliptic, brown; blade lingulate, rounded-apiculate, 3–4 cm. broad, often irregularly purple-spotted: scape erect or ascending, slender, soon glabrous, usually shorter than the leaves; scape-bracts ovate-lanceolate, lepidote, the

lower ones acuminate, imbricate, the upper ones rounded-apiculate, shorter than or equaling the internodes: inflorescence lax, tripinnate or bipinnate with the primary branches not over 6 cm. long, 13–22 cm. long; axis flexuous; primary bracts like the upper scape-bracts, much shorter than the axillary branches, spreading: spikes laxly 10–25-flowered, 5–10 mm. broad, often curved, suberect or spreading; rhachis flexuous to geniculate, angled; floral bracts ovate-acute, convex, ecarinate, 4–5 mm. long, equaling the sepals or rarely somewhat shorter, not imbricate at maturity, sparsely punctulate-lepidote, subcoriaceous, even or faintly few-nerved in age: flowers suberect, sessile, 2–4 mm. apart, not touching at maturity, much exceeding the internodes; sepals obovate, sparsely punctulate-lepidote or glabrous, even; petals and genitalia unknown: capsule narrowly cylindric, abruptly short-beaked.—Epiphytic; Trinidad, Venezuela.—Bak. Journ. Bot. xxv. 303 (1887); Brom. 194 (1889); Mez in DC. Mon. ix. 750 (1896). Not *T. micrantha* Bak. Bull. Torr. Bot. Club. xxix. 698 (1902), published as a new species in spite of the previous use of the name for a perfectly valid species.

TRINIDAD: Mt. Tocuche, 1920, *Britton, Coker & Rowland 1323 in part* (G); Heights of Aripo, 1922, *Broadway 9912* (NY); indefinite, 1877–80, *Fendler 818* (Kew, TYPE; phot. G). VENEZUELA: NUEVA ESPARTA: Island of Margarita, San Juan Mt., alt. 600 m., 1903, *J. R. Johnston 313* (G); AMAZONAS: Laterite Valley, Savanna Hills, summit of Mt. Duida, alt. 1350 m., 1928-9, *G. H. H. Tate 782* (NY).

14. **Tillandsia spiculosa** Griseb. Acaulescent, 8 dm. or often much less: leaves rosulate, 3–4 dm. long, obscurely punctulate-lepidote throughout, often irregularly purple-spotted; sheath relatively large, broadly ovate, dark brown; blade loriform or subloriform, rounded-apiculate or acute, 2–4 cm. broad: scape erect, glabrous, often much exceeding the leaves; scape-bracts narrowly elliptic, rounded-apiculate or short-caudate, about equaling the internodes or the upper ones somewhat shorter, punctulate-lepidote: inflorescence tripinnate or if bipinnate the branches not over 6 cm. long, lax; axes soon glabrous; primary bracts narrowly ovate, apiculate, much shorter than the axillary branches: spikes linear, often curved, densely 24–flowered, 90 mm. long, 6–9 mm. wide, spreading, often long-stipitate with sterile bracts at base; floral bracts broadly ovate, 6–9 (rarely 5) mm. long, equaling or slightly exceeding the sepals, convex, ecarinate, coriaceous, even or faintly few-nerved, scantly lepidote or glabrous: flowers sessile or subsessile, spreading, crowded and touching at maturity; sepals broadly elliptic, even, glabrous; petals orange or yellow, acute; stamens included, anthers deltoid; ovary globose, style short: capsule narrowly cylindric, 22 mm. long.

a. Var. **typica**. Sterile bases of the branches longer than the primary bracts: leaf-blade rounded-apiculate.—Epiphytic; Venezuela, Colombia, Bolivia.—Griseb. in Goett. Nachr. 17 (1864); Bak. Brom. 195 (1889) except *Fendler 2446;* Mez in DC. Mon. ix. 746 (1896). *T. micrantha* Bak. Bull. Torr. Bot. Club. xxix. 698 (1902), but not *T. micrantha* Bak. Journ. Bot. xxv. 303 (1887).

VENEZUELA: Aragua: near Colonia Tovar, 1854–5, *Fendler 1511* (Kew; phot. G). COLOMBIA: Magdalena: Santa Marta, 1898–9, *H. H. Smith 2852* (NY; phot. G). BOLIVIA: La Paz: Yungas, 1885, alt. 2000 m., *Rusby 2852* (NY, TYPE of *T. micrantha*).

b. Var. **palmana** (Mez) L. B. Smith (see p. 14). Sterile bases of the branches shorter than the primary bracts: leaf-blades rounded-apiculate.—Epiphytic; Costa Rica.—*T. palmana* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 9 (1901).

COSTA RICA: San José: San Jerónimo, alt. 1500 m., 1909, *Biolley 17363* (US); Cartago: Pejivalle, alt. 900 m., 1926, *Standley & Valerio 47229* (US); Rio Reventado, north of Cartago, alt. 1460–1650 m., 1926, *Standley & Valerio 49503* (US); El Muñeco, south of Navarro, alt. 1400 m., 1924, *Standley 33763, 33781* (US); El Muñeco on the Rio Navarro, alt. 1400–1500 m., 1926, *Standley & Torres 51784, 51296* (US); Orosi, 1924, *Standley 39910, 39918, 39930* (US); Cartago, alt. 1400 m., 1901, *Wercklé 16177* (US; phot. G).

c. Var. **Rothschuhiana** (Mez) L. B. Smith (see p. 14). Sterile bases of the branches shorter than the primary bracts: leaf-blade acute.—Epiphytic; Nicaragua.—*T. Rothschuchiana* Mez in DC. Mon. ix. 645 (1896). *T. Rothschuhiana* Mez in Engl. Bot. Jahrb. xxx. Beibl. 67, 8 (1901).

Low woods in hills near Jimotega, Nicaragua, *Rothschuh 54*. Known from type collection only, not seen.

15. **Tillandsia Fawcettii** Mez. Acaulescent, 1 m. or more high: leaves densely rosulate, coriaceous-chartaceous, densely appressed-pale-lepidote; sheaths unknown; blades oblong, nearly 4 cm. broad, rounded-apiculate: scape stout, erect, nearly glabrous: scape-bracts ovate, cinereous-lepidote, the lower ones acuminate, imbricate, the upper ones acute, equaling the internodes: inflorescence (imperfectly known) lax, tripinnate, not ferruginous-lepidote; axis strongly geniculate, glabrous; branches remote, suberect, 11 cm. long; primary bracts reflexed, equaling the scape-bracts, much shorter than the axillary branches: spikes long-stipitate, very laxly 10-flowered, scarcely more than 8 cm. long; rhachis undulate, not winged; floral bracts not at all imbricate or concealing the rhachis, about 7 mm. long, distinctly exceeding the sepals, elliptic, obtuse, not at all incurved at apex, coriaceous, even, lepidote: flowers (imperfectly known) erect, subsessile; sepals 5 mm. long, rigid, scantly lepidote. —Jamaica.—Mez in DC. Mon. ix. 752 (1896).

Not seen. Known from type only, which came from the Blue Mountains, Jamaica, *Harris in herb. Bot. Dept. 5186*, in herbarium of Krug and Urban, in Berlin.

16. **Tillandsia homostachya** André. Acaulescent, 5 dm. high: leaves few, 2 dm. long, densely rosulate, densely and finely appressed-lepidote; sheaths very large, elongate, ventricose; blades lanceolate, acuminate, 30 mm. broad, coriaceous: scape slender, erect; scape-bracts elliptic-acute, erect, whitish, lepidote, somewhat exceeding the internodes: inflorescence laxly bipinnate, distichous, 15 cm. long, pale-lepidote, composed of about 10 spikes; axis flexuous, compressed; primary bracts 30 mm. long, oblong-acute, strongly keeled: spikes subsessile, somewhat spreading, rather densely flowered, 40 mm. long; rhachis flexuous to geniculate, compressed; floral bracts ovate-acute, conspicuously incurved at apex, 8 mm. long, distinctly exceeding the sepals, lepidote, not imbricated nor concealing the axis, even or faintly few-nerved: flowers suberect, more than twice the length of the internodes; sepals obovate, rounded at apex, lepidote, coriaceous; petals flavous, slightly longer than the sepals; stamens included; ovary globose, style short.—Ecuador.—André, Rev. Hort. lx. 567 (1888); Brom. André, 70, t. 25, fig. a (1889): Bak. Brom. 193 (1889); Mez in DC. Mon. ix. 751 (1896).

ECUADOR: Pichincha: western slope of Mt. Corazon, alt. 2600–2800 m., 1876, *André 3763 in part* (Kew, type; phot. G).

17. **Tillandsia monticola** Mez & Sodiro. Acaulescent, stiffly erect, 7 dm. high: leaves rosulate, 3 dm. long, densely and finely punctulate-lepidote; sheaths elongate-elliptic, forming a subfusiform pseudo-bulb nearly closed at the apex; blade 35 mm. broad, oblong, abruptly acute at apex, rigid in the dried specimen: scape slender, much exceeding the leaves, strict, scantly lepidote; scape-bracts elliptic, abruptly acute, densely lepidote, slightly exceeding the internodes: inflorescence strict, erect, 30 cm. long, 8 cm. wide, laxly subthyrsoid, acute, tripinnate, glabrous or subglabrous; axis slender, obscurely angled; branches subdistichously and rather closely inserted, suberect, more or less geniculate, usually bearing 3 spikes; primary bracts elliptic, abruptly acute, exceeding the point of insertion of the lowest spike: spikes laxly 14-flowered, suberect, short-stipitate, 40 mm. long, 13 mm. wide, strongly compressed, oblong, abruptly acute; axis strongly geniculate, angled; floral bracts not imbricated nor concealing the rhachis at maturity, suberect to spreading, broadly ovate, abruptly acuminate, convex, ecarinate, 8 mm. long, 7 mm. wide, exceeding the sepals, coriaceous, even, punctulate-lepidote, especially the upper ones incurved at apex:

flowers sessile, erect or suberect, 7 mm. long; sepals strongly asymmetric, obovate, broadly rounded at apex, 6 mm. long, coriaceous, even, scantly lepidote; petals 1 mm. longer than the sepals, blades narrowly elliptic, minutely apiculate, spreading; stamens included, anthers nearly 2 mm. long; ovary trigonous, style thick, stigmas even with the middle of the anthers.—Epiphytic; Ecuador, Bolivia.—Mez & Sodiro, Bull. Herb. Boiss. ser. 2, iv. 1135 (1904).

BOLIVIA: La Paz: San Carlos, near Mapiri, alt. 750 m., 1907, *Buchtien 1266* (US).

The specimen cited above agrees very closely with the description of the type from the slopes of Mt. Pululahua, in the Province of Pichincha, Ecuador (*Sodiro 17133* in herb. Mez), and although the floral bracts are obscurely nerved in some cases and the leaves are heavily and irregularly spotted with dark purple it is certainly conspecific with *T. monticola*.

18. **Tillandsia pendulispica** Mez. Acaulescent, about 5 dm. high, slender: leaves 30 cm. long, densely rosulate, coriaceous, densely and finely appressed-lepidote, often dark purple-spotted; sheaths very large, ovate, usually dark on the inner surface, forming a large ellipsoid pseudo-bulb, brown-lepidote; blade 8–12 mm. wide, linear or narrowly triangular, acuminate: scape slender, erect, glabrous; scape-bracts lanceolate, acute, stiffly erect and appressed to the scape, much shorter than the internodes: inflorescence bipinnate or a few of the lower branches divided, exceeding the leaves, composed of 16 spikes or often less; axis scantly tomentose-lepidote, becoming glabrous; primary bracts like the scape-bracts but obtuse, stiffly erect, usually much shorter than the stipe of the axillary spike: spikes more or less densely 10–20-flowered, slender, oblong, 50 mm. long, 10 mm. wide with the rhachis strongly geniculate or longer and narrower when the rhachis is more nearly straight, all about the same size, the lower ones long-stipitate and pendulous or arching-decurved; rhachis undulate-geniculate, somewhat tomentose-lepidote, becoming glabrous; floral bracts imbricated, suborbicular-ovate when expanded, 7 mm. long, exceeding the sepals, strongly convex, ecarinate, submembranaceous, prominently nerved, soon glabrous: flowers erect, sessile; sepals 5 mm. long, obovate, rounded-emarginate, cucullate-concave, even, soon glabrous; petals conglutinated, 2 mm. longer than the sepals, yellow with opaque dots; stamens included, anthers deltoid-cordate; ovary broadly ellipsoid, abruptly contracted into the short style: capsule cylindric, 13–15 mm. long, short-beaked.—Epiphytic; Peru, Bolivia.—Mez in DC. Mon. ix. 745 (1896). *T. scorpiura* Mez. Bull.

Herb. Boiss. ser. 2, v. 104 (1905). *T. triangularis* Rusby, Desc. So. Am. Pl. 3 (1920).

PERU: HUANUCO: near Cuchero, *Poeppig 1348* (Hb. Boiss., TYPE; phot. G); JUNIN: Hacienda Schunke, La Merced, alt. 1200 m., 1923, *Macbride 5784* (G, FM); PUNO: near Tambo Cotani on the road between Sandia and Chunchusmayo, alt. 1500 m., 1902, *Weberbauer 1287* (Berlin, TYPE of *T. scorpiura;* phot. G). BOLIVIA: near Cochabamba according to Rusby, *Bang* (NY, TYPE of *T. triangularis;* phot. G).

19. **Tillandsia quadripinnata** Mez & Sodiro. Acaulescent, relatively large: leaves densely rosulate, 4 dm. long, chartaceous in the dried specimen, so appressedly lepidote as to appear glabrous; sheaths elliptic, densely brown-lepidote; blade lorate, abruptly acute, 35 mm. broad: scape unknown: inflorescence ample, laxly 4-pinnate, narrowly acute at apex, probably not pendulous (?), 50 cm. long, 17 cm. wide, lepidote; axis stout, somewhat angled above, soon glabrous; branches subdistichously and very distantly inserted, angled, pale-lepidote, bearing 3–7 spikes, the lowest usually the least divided; primary bracts spreading, lanceolate-acuminate, much exceeding the lowest spike of the branch, appressed-lepidote: spikes densely 8-flowered, sessile or subsessile, somewhat spreading, scarcely 20 mm. long, 12 mm. wide, strongly compressed, subovate or elliptic, rounded at apex; rhachis strongly geniculate, densely lepidote; floral bracts not imbricated, nor concealing the rhachis, nearly erect or rarely distinctly spreading, 5 mm. or more long, 7 mm. wide, equaling or exceeding the sepals, subreniform and retuse when expanded, scarcely or not at all keeled, not at all incurved at apex, closely nerved, densely appressed-lepidote, coriaceous: flowers subsessile, 5.5 mm. long, nearly erect; sepals strongly asymmetric, obovate, rounded at apex, 5 mm. long, glabrous, shining, coriaceous, brown; petals 0.5 mm. longer than the sepals, tubular-conglutinated but actually free, broad, the blades rounded-emarginate, yellow in the dried specimen; stamens ¾ as long as the petals, anthers 1.5 mm. long, acute; ovary short-cylindric, 3-ribbed, style equaling the anthers.—Epiphytic; Ecuador.—Mez & Sodiro, Bull. Herb. Boiss. ser. 2, v. 105 (1905).

Type from the subandine forests of Mt. Corazón, Province of Pichincha, Ecuador, *Sodiro 171/31* in Herb. Mez.

20. **Tillandsia subalata** André. Acaulescent, 6 dm. high: leaves few, densely rosulate, 15–40 cm. long, densely and finely appressed-lepidote throughout, coriaceous; sheaths large, narrowly ovate, brown; blades 20–30 mm. wide, linear-lanceolate, acuminate, often involute: scape slender, erect, compressed; scape-bracts oblong, apiculate or short-caudate, about equaling the internodes: inflorescence laxly tripinnate,

imperfectly distichous, its axes densely and finely pale-ferruginous-lepidote throughout, becoming glabrous only in extreme age; axis flattened, channeled; branches 4–5 cm. long, usually much divided; primary bracts ovate-acute, the lowest 35 mm. long, much shorter than the axillary branches, sparsely fine-lepidote: spikes about 10-flowered, spreading; rhachis strongly geniculate, obscurely wing-angled; floral bracts ovate-acute, 7–9 mm. long, obscurely keeled, incurved at apex, not imbricate at maturity, exceeding the sepals, sulcate with a strong midnerve, lepidote, membranous: flowers sessile, suberect, 7 mm. long; sepals subelliptic, obtuse, 5 mm. long, keeled, lepidote; petals yellow, 2 mm. longer than the sepals, spreading; stamens included; style shorter than the ovary, ovary ellipsoid.—Epiphytic; Colombia.—André, Rev. Hort. lx. 567 (1888); Brom. André, 70, t. 25, fig. b (1889); Bak. Brom. 193 (1889); Mez in DC. Mon. ix. 752 (1896). *T. Belcana* André, Brom. André, 69 t. 24, fig. b (1889). *T. brevispicula* André, Rev. Hort. lx. 567 (1888); Bak. Brom. 193 (1889); Mez in DC. Mon. ix. 753 (1896).

COLOMBIA: Tolima: mountains at Las Cruces, near Quindio, 1876, *André 3763 in part* (NY, phot. G); Cauca: western Cordillera, "San Jose," San Antonio, alt. 2400–2700 m., 1922, *Pennell & Killip 7406*, *Pennell 7564* (G); Nariño: near Pasto, alt. 2800 m., 1876, André 2496 (Kew, type of *T. brevispicula;* phot. G). ECUADOR: Pichincha: Niebli, alt. 2000 m., 1876, *André 3763 in part* (Kew, type; phot. G).

21. **Tillandsia sinuosa** L. B. Smith (see p. 14). Acaulescent, nearly 6 dm. high: leaves rosulate, 23 cm. long, densely appressed-punctulate-lepidote; sheaths ovate, brown; blades narrowly triangular, long-acuminate, 20 mm. broad: scape erect, slender; scape-bracts narrowly elliptic, apiculate, densely imbricated: inflorescence laxly tripinnate, 30 cm. long, 12 cm. wide, nearly glabrous; primary bracts narrowly lanceolate, spreading, much shorter than the axillary branches: spikes narrowly linear, 5 cm. long, 5 mm. wide, laxly 14-flowered, rhachis sinuous, slender, scantly lepidote; floral bracts erect, ovate-acute, 5–6 mm. long, equaling the flowers, much exceeding the internodes, lepidote, sulcate, keeled toward the apex, incurved: flowers minute, erect; sepals asymmetric, narrowly obovate, apiculate, lepidote; petals slightly longer than the sepals, acute, yellow, punctulate: stamens deeply included, exceeding the style, anthers ovoid, minutely mucronate at apex: capsule narrowly cylindric, 2 cm. long. Pl. II, figs. 8–12.

ECUADOR: Loja: between El Tambo and La Toma, alt. 1000–2200 m., *A. S. Hitchcock 21358* (G, type; NY).

22. **Tillandsia membranacifolia** L. B. Smith (see p. 14). Acaulescent, 5 dm. high: leaves rosulate, 25 cm. long, very thin, almost mem-

branaceous; sheaths broadly elliptic, densely covered with minute brown scales; blades lorate, 45 mm. broad, rounded-apiculate at apex, finely lepidote but appearing glabrous: scape erect, shorter than the leaves, glabrous; scape-bracts elliptic, apiculate, appressed-pale-lepidote, exceeding the internodes: inflorescence laxly distichous, bipinnately paniculate, ovoid, 30 cm. long, 12 cm. broad: axis straight, compressed, bicanaliculate, nearly glabrous; primary bracts small, scarcely more than 15 mm. long, ovate-acute, spreading or reflexed: spikes subdensely 23-flowered, spreading, slightly arching, 70 mm. long, 6–10 mm. wide (without the capsules), the lower long-stipitate, bearing sterile bracts at the base; rhachis undulate, strongly compressed, angled, excavated next the flowers, scantly pale-lepidote; floral bracts broadly ovate, boat-shaped, slightly but regularly shorter than the sepals, not keeled, impressed to the middle by the flower below, even, scantly lepidote: sepals asymmetric, obovate, scarcely over 5 mm. long, retuse, keeled toward the base, even; petals and genitalia unknown: capsule narrowly cylindric, apiculate, 18 mm. long. Pl. II, figs. 4–7.

COLOMBIA: SANTANDER: epiphytic, woods, Mesa de los Santos, eastern Cordillera, alt. 1500 m., 1926, *E. P. Killip & Albert C. Smith 15067* (G, TYPE).

23. **Tillandsia Michelii** Mez. Acaulescent, 6–10 dm. high: leaves few, erect, densely rosulate, 25 cm. long; sheaths ovate-elliptic, densely finely brown-lepidote; blades lorate, rounded-apiculate, 27 mm. broad, densely and finely pale-appressed-lepidote, gray-green, coriaceous: scape stout, erect, or slightly curving, lepidote; scape-bracts subcaudate, much shorter than the internodes: inflorescence erect, laxly tripinnate, subeffuse, much exceeding the leaves, 2–4 dm. long; axis pale-lepidote, straight or nearly so; branches arching-pendulous, 11 cm. long, bearing 3–4 pendent spikes near the end; primary bracts erect, very short, tubular-involute, broadly elliptic, rounded or apiculate: spikes short-stipitate, subdensely 10–14-flowered: floral bracts 5 mm. long, slightly shorter than the sepals, laxly imbricate, not concealing the rhachis, densely appressed-lepidote, convex, scarcely keeled, somewhat incurved: flowers suberect, not at all secund; sepals asymmetric, elliptic, rounded at apex, coriaceous: capsules short-cylindric, 10 mm. long.—Epiphytic; Colombia.—Mez, Bull. Herb. Boiss. ser. 2, iii. 146 (1903).

COLOMBIA: eastern side of western Cordillera, alt. 2500 m., 1899, *Langlassé 94* (G, ISOTYPE).

24. **Tillandsia insularis** Mez. Plant probably a meter high, but known only from fragments (mature inflorescence and small sterile rosettes of leaves supposedly belonging to the same species), acaules-

cent: leaves rosulate, membranaceous-chartaceous; sheath ovate; blade sub-lorate, rounded and apiculate-recurved at apex: scape and its bracts unknown: inflorescence dense, narrow, 3–4-pinnate; axes all ascending, slightly undulate, glabrous; mature branches 15–20 cm. long; primary bracts 4–6 cm. long, narrowly ovate-acute, membranaceous, sulcate; bracts at base of spikes but little larger than the floral bracts: spikes linear, sessile to short-stipitate, 80 mm. long, 8–10 mm. wide (irrespective of the capsules), often bearing many sterile bracts at the apex; rhachis strongly angled, more or less geniculate, glabrous; floral bracts distinctly shorter than the mature sepals, ovate-acute, keeled, sulcate, glabrous: flowers erect, mostly appressed to the rhachis and barely overlapping the flower next above, subsessile; sepals 6–7 mm. long, oblong-acute, keeled, slightly asymmetric, free, glabrous, sulcate; petals and genitalia unknown: capsule cylindric, acute with a short beak, 20–25 mm. long.—Epiphytic and terrestrial, Galapagos Islands.—Mez in DC. Mon. ix. 756 (1896).

GALAPAGOS ISLANDS (to Ecuador): Duncan Island, 1891, *G. Baur 237* (G); Charles Island, alt. 425 m., 1905, *A. Stewart 1116* (G); Wreck Bay, Chatham Island, alt. 200 m., 1906, *A. Stewart 1117* (G).

25. **Tillandsia multiflora** Benth. Acaulescent, 4–8 dm. high: leaves rosulate, densely punctulate-lepidote throughout; sheaths scarcely distinguished from the blades: scape erect, glabrous, mostly shorter than the leaves; scape-bracts straw-colored, punctulate-lepidote: inflorescence many-flowered, erect, tripinnate, lax, 40 cm. long, 15 cm. wide; axis rather stout, nearly straight, sulcate, glabrous; primary bracts variable, punctulate-lepidote; secondary bracts always small, but little larger than the floral bracts; branches spreading: spikes oblong, 30–50 mm. long, 10–13 mm. wide, spreading, rather densely 15–21-flowered, subsessile or short-stipitate; rhachis geniculate, strongly angled, sulcate, glabrous; floral bracts ovate-acute, distinctly nerved, sharply keeled, submembranaceous, scantly pale-lepidote or glabrous, 3–5 mm. long, the basal ones nearly equaling the sepals, the apical ones only about half as long: flowers 6 mm. long, sessile or subsessile, spreading; sepals oblong, asymmetric, free, 5 mm. long, nerved, sharply keeled; petals 1 mm. longer than the sepals, conglutinated, spreading at apex; stamens included; pistil short, included, ovary nearly spherical, style short, stout: capsule cylindric, short-beaked, 15–25 mm. long.—Epiphytic; Ecuador.—Benth. Bot. Sulph. 174 (1844).

a. Var. **typica.** Leaves 3 dm. long; blade about 10 mm. broad, very narrowly triangular with a long caudate tip: scape-bracts all greatly exceeding the internodes, all with long-caudate tips: primary bracts elongate-lanceolate, acuminate, the lower ones exceeding the

axillary branches at maturity.—Bak. Brom. 195 (1889), exclusive of specimens of Pavon, Sinclair, and Barclay according to Mez; Mez in DC. Mon. ix. 754 (1896).

ECUADOR: Guayas: near Guayaquil, *Cuming 1269* (KEW, type; phot. G); Manabi: Recreo, *Eggers 15040* (US, FM).

b. Var. **decipiens** (André) L. B. Smith (see p. 13). Leaves 4 dm. long; blade 25 mm. broad, narrowly triangular with a long caudate tip: scape-bracts all greatly exceeding the internodes, all with long caudate tips: primary bracts lanceolate, acute or short-acuminate, shorter than the axillary branches.—*T. decipiens* André, Rev. Hort. lx. 567 (1888); Brom. André, 68, t. 24, fig. a (1889); Bak. Brom. 193 (1889); Mez in DC. Mon. ix. 754 (1896).

ECUADOR: Chimborazo: near Sabanetas, *André 4055* (NY, isotype; phot. G); Oro: near Machala, 1836, *Barclay 524* (Br. Museum, phot. G); between Machala and Puerto Bolivar, alt. 0–10 m., 1923, *Hitchcock 21106* (G); Portovelo (gold mine near Zaruma), alt. 600–1000 m., 1923, *Hitchcock 21244* (G).

c. Var. **tomensis** L. B. Smith (see p. 13). Leaves 26 cm. long; blade 2.5–3 cm. broad, elongate-lanceolate, acute or very short-acuminate: scape-bracts equaling or slightly exceeding the internodes, the upper ones apiculate, the lower short-caudate: primary bracts broadly lanceolate, apiculate, much shorter than the axillary branches. Pl. V, figs. 1–4.

ECUADOR: Loja: between El Tambo and La Toma, alt. 1000–2200 m., 1923, *Hitchcock 21357* (G, type).

26. **Tillandsia pallidoflavens** Mez. 1 m. or slightly more in height: leaves about 20, densely subbulbose-rosulate, 30–40 cm. long, finely punctulate-lepidote; sheaths large, elliptic, or the outer ones ovate-elliptic, densely brown-lepidote; blades 30 mm. broad, linear, narrowly acute, light green, not spotted: scape erect, slender, terete, nearly twice as long as the leaves, subglabrous; scape-bracts subfoliaceous, lanceolate, narrowly acute, the lower ones much exceeding the internodes, the upper ones slightly: inflorescence erect, amply tripinnate, sub-glabrous, lax, 50 cm. long, 12 cm. wide, narrowly acute at apex, three times as high as the leaves; axis subterete, straight; branches arched-ascending, 12 cm. long, the upper ones simple, the lower ones bearing 2–6 spikes; primary bracts all much shorter than the axillary branches: spikes short-stipitate, very laxly 12-flowered, nearly erect or somewhat spreading, 40 mm. long; rhachis angled, flexuous, pale-appressed-lepidote, soon glabrous; floral bracts 4 mm. long, shorter than the sepals, subreflexed, triangular, acute, densely appressed-

lepidote, even, pale yellow: flowers sessile; sepals asymmetric, obtuse, coriaceous, densely pale-lepidote; petals 1 mm. longer than the sepals, much exceeding the stamens, pale yellow; style short.—Epiphytic; Peru.—Mez, Fedde Rep. Spec. Nov. iii. 36 (1906).

PERU: ANCACHS: Prov. of Huari, Puccha Valley above Masin, alt. 2600–2700 m., 1903, *Weberbauer 3298* (Berlin, TYPE; phot. G).

27. **Tillandsia Weberbaueri** Mez. Acaulescent, 3–5 dm. high, relatively slender: leaves densely bulbose-rosulate, 2 dm. long, covered throughout with hyaline brown-centered appressed scales; sheaths broadly elliptic, densely lepidote; blades 5 mm. wide, linear-acuminate: scape very slender, erect, subglabrous; scape-bracts narrowly lanceolate, acute or acuminate, cinereous-lepidote, the upper ones slightly shorter than the internodes: inflorescence very laxly tripinnate, distichous, pyramidal, exceeding the leaves, 12–23 cm. long, 8–15 cm. broad; axis nearly glabrous, more or less undulate, obscurely angled; primary bracts like the scape-bracts, much shorter than the axillary branches and enfolding their bases: spikes oblong, 25–40 mm. long, 10 mm. wide, laxly 6–14-flowered, long-stipitate; rhachis slightly geniculate; floral bracts ovate-acute, 2–3 mm. long, not keeled, even or obscurely nerved, pale-lepidote: flowers suberect to spreading, sessile; sepals 3–4 mm. long, exceeding the floral bracts, asymmetric, obovate, more or less lepidote, coriaceous; petals scarcely exceeding the sepals, narrow, greenish-white; stamens included, anthers cordate, apiculate; ovary nearly spherical, obscurely 3–angled, abruptly contracted to the short style, stigma even with the middle of the anthers.—Epiphytic; Peru.—Mez, Bull. Herb. Boiss. ser. 2, v. 104 (1905).

PERU: JUNIN: Hacienda Schunke, La Merced, alt. 1200 m., 1923, *Macbride 5757* (FM, phot. G); PUNO: in open woods near Chunchusmayo, prov. of Sandia, alt. 900 m., 1902, *Weberbauer 1231* (Berlin, TYPE; phot. G.).

28. **Tillandsia ropalocarpa** André. Acaulescent: leaves rosulate, 25–30 cm. long, heteromorphous, lepidote, coriaceous: sheath large, broadly ovate, dark brown; blade triangular, those of the outer leaves narrow, involute, and abruptly contracted from the sheaths, those of the inner broader, flat, and scarcely distinguished from the sheaths: scape erect, slender, compressed, obscurely channeled on each side, lepidote; scape-bracts very short, ovate-apiculate, remote: inflorescence laxly tripinnate; branches of 2–4 spikes; primary bracts ovate-acute, very short, loosely enfolding the bases of the axillary branches: spikes very laxly 5–12-flowered, oblong, long-stipitate; rhachis slightly flexuous, lepidote; floral bracts 2–4 mm. long, shorter than the sepals, boat-shaped, acute, sulcate: flowers suberect; sepals asymmetric, sul-

cate; petals very small, yellow: capsule cylindric, apiculate.—Colombia.—André, Rev. Hort. lx. 566 (1888); Brom. André, 66, t. 23, fig. a (1889); Bak. Brom. 192 (1889); Mez in DC. Mon. ix. 646 (1896). *T. rhopalocarpa* Mez in DC. Mon. ix. 757 (1896).

COLOMBIA: Caldas or El Valle (?): Andes of Quindio, near Tambores, alt. 1280 m., 1876, *André 2319* (NY; Kew, type; phot. G). El Valle: La Cumbre, alt. 1600–2000 m., 1922, *E. P. Killip 5843* (G).

29. **Tillandsia commixa** Mez. Acaulescent, 55 cm. high: leaves ventricose-rosulate, scarcely 3 dm. long; blade 18 mm. wide, narrowly triangular, acuminate, somewhat dark-spotted, minutely appressed-lepidote especially below: scape slender, erect, much exceeding the leaves; scape-bracts few, remote, ochreiform, especially the upper ones rounded at apex, lepidote: inflorescence erect, lax, 3-pinnate (the lowest branches bearing 2 spikes), 20 cm. long, 10 cm. wide, twice as high as the leaves; axis nearly straight, subglabrous; branches 70 mm. long, curved-ascending; primary bracts 9 mm. long, much shorter than the axillary branches, enclosing the base of the branch, rounded at apex: spikes short-stipitate, laxly 18-flowered, linear-oblong, 40 mm. long, 9 mm. wide, truncate at apex; rhachis distinctly angled, slightly undulate, lepidote; floral bracts minute, scarcely 2 mm. long, much shorter than the sepals, ovate-obtuse, sparingly lepidote, even, subreflexed: flowers spreading, not at all secund, 4 mm. long; sepals asymmetric, broadly elliptic, rounded; petals 0.5 mm. longer than the sepals, yellowish, exceeding the stamens.—Peru.—Mez, Fedde Rep. Spec. Nov. xvi. 75 (1919). *T. parvifolia* Bak. Journ. Bot. xxv. 303 (1887) nomen, error, not R. & P. *T. parviflora* Auct., not R. & P. (1802); Bak. Brom. 192 (1889); Mez in DC. Mon. ix. 756 (1896).

PERU: Amazonas: near Chachapoyas, 1840, *Mathews* (Kew, type; phot. G).

30. **Tillandsia flexuosa** (Bak.) Mez. Acaulescent or becoming short-caulescent by the loss of the lowermost leaves, 11 dm. high or less: leaves rosulate, erect, 3 dm. long, minutely punctulate-lepidote, thin, flexible; sheath narrowly ovate-elliptic, dark brown; blade narrowly triangular, tapering into a whip-like point, light gray-green, pale-lepidote: scape slender, erect, soon glabrous; scape-bracts elliptic-lanceolate, acuminate, submembranaceous, densely punctulate-lepidote, the upper ones somewhat shorter than the internodes: inflorescence erect or pendulous, tripinnate, narrow, 40 cm. long, 14 cm. wide, lax; axes slightly flexuous, slender; lower branches with a long stipe which equals or exceeds the primary bracts, composed of 2–3 spikes; bracts below the spikes small, not extending beyond the second lowest flower: spikes laxly 8–14-flowered, oblong, 4–5 cm. long, spread-

ing or ascending; rhachis slightly or not at all flexuous, terete, densely ferruginous-lepidote; floral bracts shorter than the mature sepals, ovate-acute, nerved, ferruginous-lepidote: flowers suberect to spreading, sessile; sepals 4–5 mm. long, asymmetric, elliptic, broadly rounded at apex, keeled, ferruginous-lepidote; petals conglutinated, 1 mm. longer than the sepals, yellow with opaque spots (in the dried specimen), limb narrow, acute, spreading; stamens included, anthers deltoid-cordate; ovary nearly spherical, style short: capsule cylindric, acute with a short beak, 18 mm. long.—Epiphytic; Peru and Bolivia.—Mez in DC. Mon. ix. 744 (1896). *Catopsis flexuosa* Bak. Journ. Bot. xxv. 175 (1887); Brom. 154 (1889).

PERU: Huanuco: Llata, along the Rio Marañon, alt. 2300 m., 1922, *Macbride & Featherstone 2278* (G, FM). BOLIVIA: La Paz: Province of Larecaja, near Anansa, Cerro de Uacani, alt. 2700 m., 1860, *Mandon 1172* (Kew, TYPE; phot. G).

31. **Tillandsia tripinnata** (Bak.) Mez. Probably about 1 m. high, but known only from fragments: leaves unknown: scape robust, densely ferruginous-lepidote, becoming glabrous; scape-bracts elliptic, caudate, definitely exceeding the internodes: inflorescence tripinnate nearly to apex, over 30 cm. long, 13 cm. wide; axis stout, strongly geniculate; branches spreading or reflexed; primary bracts elliptic, acute, reflexed, about half as long as the axillary branches; bracts at the base of the spikes scarcely larger than the floral bracts: spikes short-stipitate, oblong, obtuse, 35 mm. long, 14 mm. wide, laxly 10-flowered; rhachis geniculate, strongly angled, ferruginous-lepidote; floral bracts shorter than the sepals, ovate-acute, 5 mm. long, spreading, not keeled, ferruginous-lepidote: flowers sessile, suberect to spreading; sepals 8 mm. long, strongly asymmetric, ovate-elliptic, obtuse, ferruginous-lepidote, becoming glabrous; petals yellow (in dried specimen), 3 mm. longer than the sepals, spreading at apex; filaments adhering to the petals, anthers scarcely 1.5 mm. long; ovary subglobose, abruptly contracted into the style: capsule unknown.—Ecuador. —Mez in DC. Mon. ix. 745 (1896). *Catopsis tripinnata* Bak. Brom. 156 (1889).

ECUADOR: Esmeraldas: Santiago, *Drake 152* (Kew); Azuay: near Sigsig, alt. 4000 m., *Pearce* (Kew, TYPE; phot. G).

32. **Tillandsia parviflora** R. & P. Acaulescent, less than 30 cm. high: leaves subbulbose-rosulate, 15 cm. long, densely and finely pale-lepidote throughout; sheath broadly ovate to nearly orbicular; blade linear: scape slender, flexuous, erect or ascending, pale-lepidote; scape-bracts small, narrowly lanceolate-acuminate, pale-lepidote, re-

mote: inflorescence lax, erect or pendulous, bipinnate, of 2–7 spikes, pale-lepidote throughout; axis slender, flexuous; primary bracts lanceolate, acute or acuminate, small, not attained further than the lowest flower of the spike: spikes linear-oblong, very laxly 6–20-flowered, usually long-stipitate, spreading, flexuous; rhachis slender, angled, geniculate to nearly straight; floral bracts ovate-acute, about half as long as the sepals, nerved, obscurely keeled: flowers suberect to spreading, sessile, minute; sepals 3–4 mm. long, asymmetric; petals slightly exceeding the sepals, conglutinated, rounded above, yellow (Ule); stamens included, filaments adherent to the petals, ribbon-shaped, anthers cordate-acute; ovary 1.5 mm. long, spherical; style 1 mm. long: capsule cylindric, apiculate. –Saxicolous and epiphytic; Peru.—Ruiz & Pavon, Fl. Peruv. iii. 41, t. 269 (1802); Schultes & Schultes in R. & S. Syst. vii. 1218 (1830); not *T. parviflora* Bak. Brom. 192 (1889); nor Mez in DC. Mon. ix. 756 (1896). *Tillandsia exigua* Ule, Verhandl. Bot. Ver. Brandenb. xlviii. 145 (1907). *Platystachys parviflora* Beer, Brom. 88 (1857). *?Pogospermum parviflorum* Brongn. Ann. Sc. Nat. ser. 5, i. 329 (1864).

PERU: Loreto: Cerro de Escalero, alt. 1200 m., 1902, *Ule 6602* (Berlin, type of *T. exigua;* phot. G); Huanuco: Rio Huallaga Cañon below Rio Santo Domingo, alt. 1300 m., 1923, *Macbride 4216* (FM, phot. G); near Huanuco, *Ruiz & Pavon* (Br. Museum, type; phot. G).

33. **Tillandsia guanacastensis** Standl. Acaulescent, 15–17 cm. high: leaves about 25, densely rosulate, 10–20 cm. long, densely punctulate-lepidote throughout with gray appressed scales; sheath 2–3 cm. wide, broadly ovate, with a narrow hyaline margin; blade 10 mm. broad at base, narrowly triangular, subulate-involute, erect or recurved: scape erect, 7–9 cm. long, almost completely concealed by the leaves, sparsely pale-lepidote; scape-bracts small, about equaling the internodes, ovate-elliptic, apiculate, pale-lepidote: inflorescence flabellate, of 2 or 3 spikes, equaling or slightly exceeding the leaves; primary bracts like the scape-bracts, extending no higher than the lowest flower of the spike: spikes densely 12–19-flowered, straight, nearly erect, 3–5 cm. long, about 1 cm. wide (irrespective of the capsules); floral bracts 4 mm. long, distinctly shorter than the sepals, convex, not at all keeled, ovate-obtuse, green, sparsely pale-lepidote, nerveless, thin: flowers sessile, nearly erect; sepals 5–6 mm. long, asymmetric, obovate, keeled toward the base, broadly rounded and emarginate at apex, very sparsely and obscurely lepidote, nerveless; petals and genitalia unknown: capsule narrowly cylindric, rounded-apiculate, 18–20 mm. long, 2.5 mm. broad; seeds pale brown, fusiform, 2 mm. long; coma white.—Epiphytic; Costa Rica.—Standl. Journ. Wash. Acad. Sci. xvii. 247 (1927).

COSTA RICA: Guanacaste: moist forest, La Tejona, north of Tilarán, alt. 600–700 m., 1926, *Standley & Valerio 46045* (US, type; phot. G); Naranjos Agrios, alt. 600–700 m., 1926, *Standley & Valerio 46391* (US).

34. **Tillandsia adpressa** André. Extremely variable in habit, acaulescent, 2–5 dm. high: leaves many, rosulate, usually forming an ovoid pseudo-bulb, 15–30 cm. long, densely appressed-punctulate-lepidote throughout; sheath broadly elliptic-ovate, dark-brown with a narrow hyaline margin, brown-lepidote; blade not over 20 mm. broad at base usually much less, narrowly triangular, involute-subulate at least near apex, erect or recurved, pale-lepidote: scape erect or nearly so, ferruginous- or pale-lepidote with minute spreading scales; scape-bracts narrowly ovate-oblong, long-caudate, usually equaling or exceeding the internodes (irrespective of the caudate tips), densely appressed-lepidote: inflorescence narrow, bipinnate, of 4–12 spikes, erect or arching-pendulous; axis straight to very strongly geniculate, spreading lepidote, becoming glabrous; primary bracts narrowly ovate-oblong, attenuate to definitely caudate, densely appressed-lepidote, usually equaling or exceeding the spikes, always attaining several of the lower flowers of the spikes: spikes distichous, normally 8–12-flowered; floral bracts distinctly shorter than the sepals at maturity, ovate-acute, densely tomentose-lepidote: flowers sessile, spreading, the terminal ones often abortive; sepals scarcely more than 5 mm. long, obovate, very asymmetric, usually distinctly keeled, densely tomentose-lepidote; capsule cylindric, apiculate, 20–25 mm. long.—Ecuador to Costa Rica.—André, Rev. Hort. lx. 566 (1888).

This species is very variable but shows three major trends as outlined below.

a. Var. **typica.** Scape-bracts remote: inflorescence arching-pendulous; axis slender, elongate: spikes erect and appressed to the axis at maturity, laxly flowered.—Ecuador.—André, Brom. André, 67 t. 23. fig. b (1889); Bak. Brom. 193 (1889); Mez in DC. Mon. ix. 758 (1896).

ECUADOR: Pichincha: near Pululagua Volcano, alt. 3000 m., 1876. *André 3792* (Kew, type; phot. G).

b. Var. **orthiantha** (Standl.) L. B. Smith (see p. 9). Inflorescence erect, compact; axis stout, straight: spikes erect and appressed to the axis at maturity, densely few-flowered.—Epiphytic; Costa Rica.—*T. orthiantha* Standl. Journ. Wash. Acad. Sci. xvii. 248 (1927).

COSTA RICA: San José: Laguna de la Chonta, northeast of Santa Maria de Dota, alt. 2000-2100 m., 1925, *Standley 42312* (US, type; phot. G), 42348 (US).

c. Var. **Tonduziana** (Mez) L. B. Smith (see p. 8). Inflorescence erect or arching-pendulous, open and elongate at maturity; axis slender:

spikes spreading or reflexed at maturity, laxly flowered.—Epiphytic; Costa Rica to Colombia.—*T. Tonduziana* Mez, Engl. Bot. Jahrb. xxx. Beibl. 67, 9 (1901). *T. Schumanniana* Mez in DC. Mon. ix. 740 (1896); Ule Verhandl. Bot. Ver. Brandenb. xlviii. 144 (1907). *Catopsis Schumanniana* Wittm. Engl. Bot. Jahrb. xi. 70 (1889); Bak. Brom. 154 (1889).

COSTA RICA: ALAJUELA: vicinity of Fraijanes, alt. 1500–1700 m., 1926, *Standley & Torres 47663* (US); HEREDIA: Cerros de Zurqui, northeast of San Isidro, alt. 2000–2400 m., 1926, *Standley & Valerio 50755* (US); Yerba Buena, northeast of San Isidro, alt. 2000 m., 1926, *Standley & Valerio 50196* (US); SAN JOSÉ: San Jeronimo, alt. 1500 m., 1909, *P. Biolley fil 17362* (US); between Aserri and Tarbaca, alt. 1600 -1900 m., 1924, *Standley 34180, 34187, 34188* (US); forests of La Palma, alt. 1459 m., 1898 *Tonduz 12670* (US); La Palma, alt. 1600 m., 1924, *Standley 38260, 38261, 38296, 38334* (US); Zurqui, alt. 2000 -2500 m., 1926, *Standley & Valerio 48297* (US); CARTAGO: El Muñeco, south of Navarro, alt. 1400 m., 1924, *Standley 33782* (US); El Muñeco, on the Rio Navarro, alt. 1400–1500 m., 1926, *Standley & Torres 51667* (US); Cerro de la Carpintera, alt. 1500–1850 m., 1924, *Standley 34305* (US); Alto de La Estrella, 1924, *Standley 39590* (US). COLOMBIA: NORTE DE SANTANDER: eastern Cordillera, vicinity of Toledo, alt. 1700–1900 m., 1927, *Killip & Smith 20106* (G); SANTANDER: eastern Cordillera, southern slope of Mount San Martin, near Chartá, alt. 2300–2500 m., 1927, *Killip & Smith 19197* (G, NY); ANTIOQUIA: forests near Amalfi, alt. 2000 m., 1884, *Lehmann XXII* (Hb. Boiss., phot. G, TYPE of *T. Schumanniana* Mez); EL VALLE: western Cordillera, La Cumbre, alt. 2100 m., 1922, *Pennell & Killip 5746* (G), *Killip 5587* (G).

35. **Tillandsia Fendleri** (Bak.) Mez. Acaulescent, 5 dm. high: leaves 10–12 in a dense rosette, 15–20 cm. long, densely punctulate throughout with minute appressed scales; sheath ovate, dark brown, brown-lepidote; blade narrowly triangular, not over 20 mm. broad at base, gray-greeen, pale lepidote: scape erect or curved, spreading-ferruginous-lepidote, becoming glabrous; scape-bracts oblong-elliptic, caudate, densely pale-lepidote, about equaling the internodes: inflorescence bipinnate, erect or pendulous, lax, 20–30 cm. long, 6–10 cm. wide, much exceeding the leaves; axis distinctly geniculate, angled, tomentosely ferruginous-lepidote, becoming glabrous; primary bracts lanceolate-acute, densely pale-lepidote, about half as long as the spikes: spikes spreading or reflexed, very laxly 3–12-flowered, distinctly stipitate; rhachis slightly flexuous, densely covered with minute spreading ferruginous scales; floral bracts distinctly shorter than the sepals, broadly ovate-apiculate, bluntly keeled, nerved, densely ferruginous-lepidote: flowers spreading, sessile, about 9 mm. long, the apical ones often poorly developed; sepals very nearly free, asymmetric, slightly longer than the petals, densely ferruginous-lepidote; petals much exceeding the stamens, blade minute; anthers lanceolate, acute at apex, 1.5 mm. long, ovary globose, abruptly contracted into the thick style, stigma even with the middle of the anthers: mature capsule

cylindric, abruptly short-beaked, 25 mm. long; seeds many, 2.5 mm. long, coma white, 15 mm. long.—Epiphytic; Hayti, Venezuela.—Mez in DC. Mon. ix. 741 (1896). *Catopsis Fendleri* Bak. Journ. Bot. xxv. 175 (1887); Brom. 155 (1889). *T. parviflora* Gris. Goett. Nachr. 16 (1864), not R. & P. *T. pauciflora* Mez in DC. Mon. ix. 741 (1896), not Gris. nor R. & P. (evidently a misprint for *T. parviflora*).

HAYTI: La Brande to Mt. Balance, alt. 1100 m., 1905, *Nash & Taylor 1757* (NY). VENEZUELA: Aragua: in mountains, near Tovar, alt. 2300 m., 1854–5, *Fendler 1523* (G, isotype); Amazonas: crest of Ridge 25, summit of Mt. Duida, alt. 2100 m., 1928–9, *G. H. H. Tate 520* (NY).

This species is intermediate between *T. adpressa* and *T. tetrantha* resembling the former in its narrow leaf-blade and the latter in its larger flowers.

36. **Tillandsia tetrantha** R. & P. Extremely variable in habit, acaulescent, 4–8 dm. long: leaves rosulate, erect, densely appressed-punctulate-lepidote throughout; sheath large, broadly elliptic-ovate, dark brown, brown-lepidote; blade 3–8 cm. broad at base, often but little narrower than the sheath, elongate-lanceolate, not triangular, usually flat, pale-lepidote, gray-green, often irregularly purple-spotted: scape usually much curved, about equaling the leaves; scape-bracts elliptic, long-caudate, inflated, loosely enfolding the scape, usually the sheathing bases shorter than the internodes, minutely lepidote: inflorescence erect or pendulous, bipinnate; axis more or less geniculate, tomentosely lepidote, becoming glabrous; primary bracts ovate or ovate-elliptic, broad, apiculate to short-caudate, varying from half as long as to distinctly longer than the spikes, finely lepidote: spikes distichous, often becoming secund-flowered, spreading or reflexed; rhachis nearly straight, tomentosely lepidote, becoming glabrous; floral bracts distinctly shorter than the sepals, broadly ovate, nerved, lepidote: flowers spreading, sessile, or at length somewhat stipitate; sepals asymmetric, obovate or oblong, blunt or with a slightly excurrent midnerve, lepidote: petals slightly longer than the sepals, with abruptly spreading limb, much exceeding the stamens, conglutinated, yellow with opaque spots toward the apex (sometimes violet according to R. & P.?); filaments ribbon-like with a dark central nerve, conglutinate with the petals, anthers deltoid-cordate; ovary ovoid, style short: mature capsule 30 mm. long, cylindric, acute at apex with a small beak.—Epiphytic; Venezuela to Peru.—R. & P. Fl. Peruv. iii. 39, t. 265 (1802).

a. Var. **typica.** Inflorescence lax, pendulous: spikes lax: floral bracts minute or wanting.—Epiphytic; Peru.—Schultes & Schultes in R. & S. Syst. vii. 1228 (1830); Bak. Brom. 206 (1889); Mez in DC. Mon. ix. 884 (1896).

PERU: Huanco: Yanano, alt. 2000 m., 1923, *Macbride 3768* (FM, G).

The plate of *Tillandsia tetrantha* in Ruiz and Pavon's Flora Peruviana agrees quite closely with the species which has been going under the name of *T. aurantiaca*, but fails to show any floral bracts, nor is any mention made of them in the description. This is significant in view of the fact that some notice is taken of the floral bracts in nearly every other species of *Tillandsia* mentioned by Ruiz and Pavon, and that Macbride's specimen, found less than fifteen miles from the type locality of *T. tetrantha*, is the only specimen of this species group known to have minute floral bracts.

b. Var. **aurantiaca** (Gris.) L. B. Smith (see p. 15). Scape-bracts mostly shorter than the internodes: inflorescence and spikes lax: primary bracts orange to dark brown, from half as long as to distinctly longer than the spikes: spikes normally 7–11-flowered; floral bracts about half as long as the sepals: flowers about 10 mm. long. —Epiphytic; Venezuela to Ecuador.—*T. aurantiaca* Gris. in Goett. Nachr. 16 (1864); André, Rev. Hort. lx. 567 (1888); Brom. André. 72 (1889); Bak. Brom. 194 (1889); Mez in DC. Mon. ix. 742 (1896). *Tussacia fulgens* Kl. in Beer, Brom. 100 (1857). *Catopsis Garckeana* Wittm. in Engl. Bot. Jahrb. xi. 70 (1889); Bak. Brom. 156 (1889).

COLOMBIA: Norte de Santander: eastern Cordillera, road from Pamplona to Toledo, crossing the divide between Rio La Teja (Maracaibo drainage) and Rio Mesmé (Orinoco drainage), alt. 2800–3000 m., 1927, *Killip & Smith 19959* (G); Santander: eastern Cordillera, western slope of Paramo de las Puentes, above La Baja, alt. 3300–3400 m., 1927, *Killip & Smith 18269* (G); mountains east of Las Vegas, alt. 3000–3300 m., 1926, *Killip & Smith 15843* (G); western slope of Paramo Rico, alt. 3000–3600 m., 1927, *Killip & Smith 17207* (G); Antioquia: plateau of Santa Rosa, alt. 2500–2700 m., 1884, *Lehmann XXI* (Hb. Boiss., phot. G, type of *Catopsis Garckeana* Wittm.); Caldas: "Pinares," above Salento, alt. 2600–2800 m., 1922, *Pennell 9268* (NY, G); Narino: Alta de Cruz Grande, alt. 3000 m., *André 2214 in part* (NY, phot. G). ECUADOR: Loja: between La Toma and Loja, alt. 1800–2600 m., 1923, *Hitchcock 21424* (US).

c. Var. **densiflora** (André) L. B. Smith (see p. 15). Leaves coriaceous, firm: scape stout, erect, entirely concealed by the scape-bracts: inflorescence erect, dense; primary bracts orange to dark brown, not completely covering the spikes: spikes oblong, densely 5–11-flowered; floral bracts about half as long as the sepals, acuminate: sepals 6–8 mm. long.—Ecuador.—*T. aurantiaca* var. *densiflora* André, Rev. Hort. lx. 567 (1888); Brom. André, 73 (1889); Bak. Brom. 194 (1889); Mez in DC. Mon. ix. 744 (1896).

ECUADOR: Chimborazo: Sabanetas, at the foot of Mt. Chimborazo, *André 2342* (NY, phot. G).

d. Var. **scarlatina** (André) L. B. Smith (see p. 15). Leaves coriaceous, firm: inflorescence elongate, lax; primary bracts usually scarlet,

sometimes pale greenish-yellow with little or no scarlet tinge, exceeding the spikes: spikes ovate to oblong, usually secund-flowering; floral bracts acuminate, about half as long as the sepals.—Epiphytic; Ecuador.—*T. aurantiaca* var. *scarlatina* André, Rev. Hort. lx. 567 (1888); Brom. André, 73 (1889); Bak. Brom. 194 (1889); Mez in DC. Mon. ix. 744 (1896).

ECUADOR: Carchi: Oreguela, alt. 2900 m., *André 3138 bis* (NY, phot. G); Loja: between San Lucas and Oña, alt. 2200–3100 m., 1923, *Hitchcock 21571* (G); between La Toma and Loja, alt. 1800–2600 m., 1923, *Hitchcock 21383* (US).

e. Var. **miniata** (André) L. B. Smith (see p. 15). Leaves soft, flexible: inflorescence small, compact, usually rather pendulous; primary bracts broad, ovate, completely covering the spikes: spikes ovate in outline, rarely over 2 cm. long; floral bracts about half as long as the sepals, acuminate or obtuse: sepals often with the midrib slightly produced.—Epiphytic; Colombia.—*T. aurantiaca* var. *miniata* André, Rev. Hort. lx. 567 (1888); Brom. André, 73 (1889); Bak. Brom. 194 (1889); Mez in DC. Mon. ix. 744 (1896).

COLOMBIA: Caldas: western Cordillera, Cerro Tatama, alt. 3200–3400 m., 1922, *Pennell 10514* (G); central Cordillera, "Magaña," old Quindio trail, alt. 3200–3300 m., 1922, *Killip & Hazen 9457* (G); Cauca: central Cordillera, thickets in and around paramo, "Llano," "Paletara," alt. 2950–3100 m., 1922, *Pennell 6979* (G); Nariño: Paramo de Guapuscal, Andes about Pasto, 1876, *André 3138* (NY, phot. G).

37. **Tillandsia rectiflora** André. Acaulescent, 1.5–3 m. high: leaves rosulate, 80 cm. long, minutely punctulate-lepidote throughout, becoming glabrous; sheath very large, ovate, dark brown; blade lorate, 8 cm. broad, subrounded at apex, apiculate, flat: scape and inflorescence dark red, scape robust, terete, erect, glabrous; scape-bracts ovate-oblong, acute, exceeding the internodes, finely pale-lepidote: inflorescence tripinnate, erect, much exceeding the leaves, 30–40 cm. long; axes glabrous, angled, slightly flexuous; branches spreading; primary bracts lanceolate-acuminate, sulcate, somewhat lepidote; bracts at base of spikes not extending beyond the second basal flower: spikes narrowly oblong, acute, 11 cm. long, scarcely more than 1 cm. wide, short-stipitate, laxly 20–30-flowered, at first distichous but soon becoming secund-flowered with all the flowers directed upwards; rhachis angled, geniculate; floral bracts 10 mm. long, equaling or exceeding the sepals in length, becoming secund with the flowers but not to so great an extent, thus disclosing the apices of the sepals, triangular, acute with the strong midnerve often prolonged into a short point, sulcate, sparingly lepidote: flowers spreading, short-pedicelled; sepals slightly asymmetric, oblong-acute, keeled, sulcate with a strong mid-

nerve, glabrous; petals white (Hitchcock) changing to yellow with opaque spots in the dried specimen, 2 mm. longer than the sepals, limb narrow, acute; stamens included, filaments ribbon-like, anthers ovate-deltoid; ovary ovoid, style short, stout: capsule cylindric, 20–28 mm. long, vertically erect.—Ecuador.—André, Rev. Hort. lx. 567 (1888); Brom. André. 62, 63 (1889); Bak. Brom. 203 (1889). *T. erectiflora* André, Brom. André. 86, t. 26, fig. b (1889), not Bak.; Mez in DC. Mon. ix. 760 (1896). *T. Fraseri* Bak. Brom. 187 (1889); Mez in DC. Mon. ix. 761 (1896).

ECUADOR: CHIMBORAZO: Huigra, 1918, *Rose, J. N. & G. 22579* (US, G); 1923, *Hitchcock 20633* (US, G). ECUADOR or COLOMBIA: *L. Fraser* (Br. Museum, TYPE of *T. Fraseri* Bak.; phot. G.)

38. **Tillandsia pectinata** André. Acaulescent, 1 m. high: leaves rosulate, 25–30 cm. long, appearing glabrous, actually very finely punctulate-lepidote; sheath brown, elliptic; blade lorate-apiculate, 4 cm. broad, flexible: scape stout, straight; scape-bracts remote, lanceolate-acuminate, appressed, diffusely lepidote: inflorescence narrow, tripinnate, 5 dm. long; upper branches simple, lower branches 70–80 mm. long, of 3–4 spikes; primary bracts lanceolate-acute, 6 cm. or less long, obscurely lepidote, chartaceous; bracts below the spikes 10 mm. long: spikes sessile or subsessile, often curved; floral bracts becoming secund with the flowers, 6–8 mm. long, about equaling the sepals, boat-shaped, ovate-acute, sulcate with a strong midnerve, densely fine-lepidote: flowers at first densely distichous, becoming secund-decurved, very short-stipitate; sepals asymmetric, obovate-obtuse, membranaceous, sparsely lepidote; petals scarcely 1 mm. longer than the sepals, yellow, recurved-spreading at apex much exceeding the stamens; style short, ovary thick-ovoid: capsule narrowly cylindric, abruptly acute, 18 mm. long.—Ecuador.—André, Rev. Hort. lx. 567 (1888); Brom. André, 87, t. 30, fig. a (1889); Bak. Brom. 204 (1889); Mez in DC. Mon. ix. 761 (1896).

Northern ECUADOR: Tusa, 1876, *André 3032* (NY, ISOTYPE: phot. G).

This species is probably closely related to *Tillandsia subalata* André and its immediate allies, but should be distinguishable from them even before the flowers become secund by its broad lorate leaf-blade.

39. **Tillandsia tristis** Mez. Inflorescence tripinnate at base, many-flowered, dense, about 30 cm. long, 12 cm. wide; axes appressed-lepidote, the floral ones particularly very flexuous and angled; branches 13 cm. long, suberect, the lowest 2–3-branched at base; primary bracts coriaceous, spreading, punctulate-lepidote, elliptic, rounded at apex, attaining the lowest flowers of the axillary branches: spikes

subsessile, 85 mm. long, secundly 20-flowered, with flowers turned downward; floral bracts much exceeding the sepals, not becoming secund, 13 mm. long, dark brown in the dried specimen, coriaceous, sparsely lepidote, scarcely nerved: flowers subsessile, slightly diverging from the rhachis; sepals 9 mm. long, distinctly asymmetric, elliptic, rounded at apex, minutely lepidote, rigid.—Colombia.—Mez in DC. Mon. ix. 762 (1896).

COLOMBIA: indefinite, *Triana* (Br. Museum, TYPE; phot. G)

40. **Tillandsia Riocreuxii** André. Acaulescent, nearly 8 dm. high: leaves in an ellipsoid-bulbous rosette, 25 cm. long, densely appressed-lepidote throughout; sheaths large, broadly ovate, ventricose, dark ferruginous; blades involute in the dried specimen except at the extreme apex, rigid, cinereous, apex acute: scape stout, erect, lepidote; scape-bracts about equaling the internodes, broadly elliptic, apiculate, slightly inflated, scantly pale-appressed-lepidote: inflorescence laxly bipinnate, distichous, narrowly pyramidal, 35 cm. long, 17 cm. broad; axis scantly fine-lepidote, angled, undulate; primary bracts like the scape bracts, spreading, barely equaling the first few flowers: spikes spreading, sublinear, 8–9 cm. long, sublaxly 10–14-flowered, bearing 1–3 sterile bracts at base; floral bracts distichous, slightly imbricate, 12 mm. long, slightly shorter than the sepals, suborbicular, obtuse, strongly convex, faintly nerved, glabrous: flowers secund, turned downwards, large, rather showy, subsessile; sepals definitely asymmetric, oblong, obtuse; petals much exceeding the calyx, blade spreading, ovate-obtuse, resembling that of species in the section *Phytarhiza;* stamens included; pistil shorter than the stamens.

ECUADOR: CHIMBORAZO: western slope of Mt. Chimborazo, alt. 2500 m., 1876, *André 4408* (Kew, TYPE; phot. G).

3. THE BROMELIACEAE OF BRITISH GUIANA.

The following treatment was begun at the request of Dr. H. A. Gleason of the New York Botanical Garden and was designed to cover the *Bromeliaceae* for his projected flora of British Guiana. As it now appears that the proposed flora will not be completed for some time, Dr. Gleason has kindly consented to my publishing here as a kind of preliminary report. It is hoped that this early publication will draw attention to the subject and that the consequent noting of desirable additions and corrections will make possible a greatly improved treatment for the flora.

At the present time records of *Bromeliaceae* from the colony are all too meagre, and it is safe to say that further collecting should double

the number of species known. For this reason a careful survey has been made of the species which from their whole range it seems logical to expect within the limits of British Guiana. These species are interpolated in the keys, though it seems best not to describe anything in the text which has no record for the colony. Also a number of species described from horticulture and doubtfully assigned to British Guiana are inserted in the key and briefly described in a supplement to the text.

In considering the geographic relations of the *Bromeliaceae* of British Guiana the scantiness of material makes it impossible to treat the regions within the colony in much detail as Professor A. S. Hitchcock did for the *Gramineae*.[1] At most it can be demonstrated that certain species such as *Aracoccus micranthus*, *Aechmea humilis*, *Ae. spicata*, *Ae. nudicaulis*, *Ae. bromeliaefolia*, *Pitcairnia Kegeliana*, *Tillandsia bulbosa*, *T. monadelpha*, and *Guzmania lingulata* are general at least throughout the forested area, while a few species, notably *Gravisia brassicoides*, *Brocchinia reducta*, *B. micrantha*, *Puya floccosa*, *P. Augustae*, *P. Quelchii*, *Tillandsia Jennani*, and *T. Turneri*, appear to be definitely restricted to the elevated savanna country on or near Mt. Roraima. The remaining species while known from only a few stations within the colony, give no basis for belief that their ranges may not be greatly extended by further collecting.

Of the 49 definitely recorded species of *Bromeliaceae* from British Guiana, there are 11 apparently endemic: *Gravisia brassicoides*, *Aechmea humilis*, *Brocchinia micrantha*, *Puya Augustae*, *P. Quelchii*, *Lindmania guianensis*, *Navia angustifolia*, *N. Gleasonii*, *Vriesia pachychlamys*, *Tillandsia Jennani*, and *Guzmania Altsonii*. *Tillandsia rhodocincta* and *T. rhododactyla* until recently were also thought to be endemic, but *T. rhodocincta* is definitely a synonym of *T. Turneri* of Colombia and Venezuela, while *T. rhododactyla* has been collected from Peru by Mr. J. Francis Macbride.[2]

The species extending beyond the limits of the colony show four major geographic trends: a general distribution throughout tropical and subtropical America, and distributions centering on the Antilles, the Andes, and the Amazon Basin respectively.

There are four species in the family, *Aechmea nudicaulis*, *Catopsis sessiliflora*, *Tillandsia recurvata*, and *T. usneoides*, which are of truly general range and these are all recorded from British Guiana.

The Antillean group comprises: *Bromelia Karatas*, *B. Pinguin*,

[1] Grasses of British Guiana, A. S. Hitchcock in Contrib. U. S. Nat. Herb. xxii. pt. 6, 439–586 (1922).

[2] PERU: HUANUCO: Rio Huallaga Cañon below Rio Santo Domingo, alt. 1300 m., 1923, *Macbride 4265* (G, FM).

Gravisia aquilega, *Catopsis Berteroniana*, *Tillandsia aloifolia*, *T. bulbosa*, *Guzmania lingulata*, and *G. capituligera*. Several species of somewhat wider range are included here, since their relative abundance in the Antilles seems to warrant such treatment.

As might be expected the species which show Andean ranges most clearly are those found in the Mt. Roraima region, *Brocchinia reducta*, *Puya floccosa*, *Tillandsia Turneri*, and *T. complanata* being good examples of this correspondence. *Tillandsia monadelpha* and *Guzmania Roezli* also show an Andean range but do not appear to be restricted within British Guiana. *Pitcairnia Funckiana* turns up in Colombia, but its status in British Guiana is uncertain.

The greatest number of *Bromeliaceae* in British Guiana seem to have been derived from the Amazon Basin or across it from eastern Brazil. Here belong: *Araeococcus micranthus*, *Wittmackia odora*, *Ananas sativus*, *Aechmea mucroniflora*, *Ae. Mertensii*, *Ae. bromeliaefolia*, *Ae. Fernandae*, *Vriesia procera*, *Tillandsia triticea*, and *T. stricta*.

The remaining non-endemic species are of too narrow a range for the most part to show a significant trend one way or another. In the case of *Aechmea tillandsioides* and *Tillandsia rhododactyla* it is difficult to decide whether they should be considered Andean or Amazonian in their ranges, so they are perforce included in the indeterminate group.

The following table summarizes the geographic trends of the British Guiana species of *Bromeliaceae:*

Endemic	11
General throughout tropical and subtropical America	4
Antillean	8
Andean	7
Amazonian	10
Miscellaneous non-endemic	11
Total	51

From the foregoing analysis of the geographic affinities of the British Guiana *Bromeliaceae* it is possible to make a certain amount of prediction as to what may logically be expected in the colony with further collecting.

The Antillean group provides the largest number of cases where definite species may be predicted, as the ranges of its most wide-spread members overlap British Guiana. Some occur in both Trinidad and Venezuela as in the case of *Bromelia chrysantha*, while others like *Catopsis nitida* jump to Dutch or French Guiana, or even to Brazil as with *Tillandsia polystachya*.

All of the truly Andean species stop in or before British Guiana, so that there is no occurrence of overlapping ranges here to indicate the presence of definite species. There is merely the possibility, and a much smaller one than in the Antillean group, of almost any of the Colombian or Venezuelan species turning up in the more elevated regions of the colony.

Much the same is true of the Amazonian species as of the Andean, but in a few cases, such as *Tillandsia pulchella* and *Vriesia platynema*, predominantly Brazilian species get over into the Antilles arguing thereby a probable occurrence in British Guiana.

Of the miscellaneous range group the majority are species found in French or Dutch Guiana and so likely to appear in British Guiana in similar situations. Here as in the Antillean group definite species suggest themselves.

The species recorded in the text are nearly all based on specimens examined by the author. The majority of the material studied was from the Herbarium of the Royal Botanic Gardens at Kew, the Jenman Herbarium at Georgetown, the Herbarium of the New York Botanical Garden, and the Gray Herbarium. The loan of material from the first three institutions was obtained through the kind offices of Dr. H. A. Gleason. In a few cases specimens have been cited on the basis of records in Mez's *Bromeliaceae*,[1] and in two instances, *Bromelia Pinguin* and *Tillandsia recurvata*, species are cited solely on the record of Schomburgk's Fauna und Flora[2] since they are almost unmistakable from habit alone and also indicate from their total range that they should occur within the limits of the colony.

No other species in Schomburgk's list are cited here without further evidence behind them, but wherever it is possible to find the identity of the names used it is indicated in the synonymy of the proper species. Both of the species figured in Rudge's Plantarum Guianae Rariorum Icones et Descriptiones (1805) are amply covered by later records.

In this treatment generic lines follow those laid down by Mez in his monograph of the family.[3] The keys also draw largely from his work but are modified to take advantage of the much more limited flora involved and so simplify them and speed them up for the student of the British Guiana flora.

[1] *Bromeliaceae* Mez, in Monographiae Phaneroganarum, De Candolle ix. (1896).

[2] Richard Schomburgk, Versuch einer Fauna und Flora von Britisch-Guiana. (1848).

[3] Bromeliaceae Mez, in Monographiae Phaneroganarum, De Candolle ix. (1896).

Genera and species not actually recorded from the region but logically to be expected are entered in parentheses. Genera and species described from horticulture and doubtfully assigned to the colony are marked with an asterisk and briefly characterized in a supplement to the text.

BROMELIACEAE J. St.-Hil. Herbs or rarely shrubby perennials, mostly epiphytic. Leaves spirally arranged, usually basal, dilated-sheathing below, simple, entire or spinulose-serrate, covered with peltate scales which serve to hold moisture. Inflorescence simple or paniculate, of spikes or racemes, usually bearing brightly colored, conspicuous bracts. Flowers perfect in all the species of British Guiana. Perianth heterochlamydeous, the segments free or variously joined. Stamens 6, filaments free or joined to the petals or to each other. Style 3-parted. Ovary inferior to superior, 3-celled. Fruit capsular or baccate. Seeds naked, winged, or plumose. Embryo small, situated at the base of the copious, mealy endosperm. About 50 genera and 1500 species, strictly confined to tropical and subtropical America.—Expos. Famil. i. 122–5, t. 19 (1805); Rudge, Pl. Guian. 31–32, t. 49–50 (1805); Meyer, G. F. W., Fl. Essequeb. 143–6 (1818); Schomburgk, Fauna u. Fl. Br.-Guian. 902–4, 1067–8, 1121–2 (1848); Beer, Fam. Brom. 1–271 (1857); Benth. & Hook. f. Gen. iii. 657–670 (1883); Wittm. in Engl. & Prantl. Nat. Pflanzenf. ii. Abt. 4, 32–59 (1887–8); Bak. Handb. Brom. 1–243 (1889); Mez in Mart. Fl. Bras. iii. pt. 3, 173–634 (1891–4); Mez in DC. Mon. Phan. ix. 1–990 (1896); N. E. Brown, Mt. Roraima in British Guiana, in Trans. Linn. Soc. ser. 2, vi. 1–107 (1901); Pulle, Enum. Pl. Surinam, 89–92 (1906).

Key to Genera.

1. Ovary wholly inferior: fruit baccate: leaves usually spinulose-serrate ..... Tribe *Bromelieae.*
   2. Pollen grains entire, bearing neither pores nor longitudinal folds: petals variously joined.
      3. Margins of the petals free, petals connected by the filaments ..... 1. *Bromelia.*
      3. Petals joined by their margins ..... **Cryptanthus.*
   2. Pollen grains variously sculptured.
      4. Pollen grains bearing pores: stamens usually included at anthesis.
         5. Inflorescence lateral, produced below the leaves. A monotypic genus, *D. basilateralis*, from French Guiana ..... (*Disteganthus*).
      5. Inflorescence central.
         6. Inflorescence without a definite scape, sunk in the leaf rosette ..... **Aregelia.*
         6. Inflorescence borne on a definite scape.
            7. Petals without scales.

8. Ovules few in each cell: inflorescence loosely paniculate: flowers not over 5 mm. long....2. *Araeococcus.*
8. Ovules many in each cell.
9. Flowers in a number of very dense cone-like spikes.....**Hohenbergia.*
9. Flowers in lax spikes in an open inflorescence, or in a single much contracted panicle.
10. Ovules borne the whole length of the cell: flowers in lax spikes.....3. *Wittmackia.*
10. Ovules borne only at the apex of the cell: inflorescence a contracted panicle. 2 species, *S. Poitaei* and *S. longifolius*, are known from French Guiana.....(*Streptocalyx*).
7. Petals each bearing two scales on the inner surface.
11. Fruits and bracts of the inflorescence coalescing at maturity to form a compound fruit....4. *Ananas.*
11. Fruits and bracts always remaining distinct.
12. Pollen grains bearing many (more than 5) pores.....5. *Gravisia.*
12. Pollen grains bearing either 2 or 4 pores.
13. Sepals long-aristate or if unarmed then the ovules long-caudate: inflorescence paniculate or simple.....6. *Aechmea.*
13. Sepals unarmed or obscurely aristate: ovules obtuse: inflorescence simple.....**Quesnelia.*
4. Pollen grains bearing longitudinal folds: stamens exserted at anthesis.....7. *Billbergia.*
1. Ovary partly or wholly superior: fruit a capsule.
14. Fruit winged or rarely naked, not plumose: ovary partly or wholly superior: leaves usually spinulose-serrate. Tribe *Pitcairnieae.*
15. Ovary only part superior: seeds winged or appendaged.
16. Flowers minute, regular: seeds few.....8. *Brocchinia.*
16. Flowers showy, zygomorphic: seeds numerous.....9. *Pitcairnia.*
15. Ovary wholly superior.
17. Seeds winged or appendaged.
18. Seeds suborbicular, wing lateral.....10. *Puya.*
18. Seeds more or less elongated, long caudate-appendaged at either pole.....11. *Lindmania.*
17. Seeds naked.....12. *Navia.*
14. Fruit plumose: ovary wholly superior: leaves entire. Tribe *Tillandsieae.*
19. Petals free.
20. Petals bearing 1 or 2 scales each at base.....13. *Vriesia.*
20. Petals without scales.
21. Plume of the mature seed folded over: inflorescence always polystichous.....14. *Catopsis.*
21. Plume of the mature seed straight: inflorescence usually distichous, if rarely polystichous then simple.....15. *Tillandsia.*
19. Petals joined or closely agglutinated: inflorescence always polystichous.....16. *Guzmania.*

1. **BROMELIA** [Plum.] L.

Coarse herbs, spreading by subterranean stolons. Leaves usually rosulate, with large curved spines along the margin. Inflorescence sessile or stipitate, always paniculate, densely tomentose-lepidote.

Sepals free or somewhat united, obtuse or acute, rarely mucronulate. Petals rarely with a definite claw, dorsally united by the filaments, but their margins free, eligulate, fleshy in most species. Stamens included, often much conjoined by their filaments. Anthers narrow, acute. Ovary passing gradually into the thick pedicel, epigynous tube conspicuous to nearly lacking. Berry succulent, relatively large. Seeds few to many, flattened, naked.—Sp. Pl. 285 (1753).

Thirty-four species. Mexico and the Antilles to Argentina.

Key to Species.

1. Inflorescence a densely capitate panicle, sessile, sunk in the leaf-rosette.
   2. Leaf strongly constricted above the sheath. French Guiana. (*B. agavifolia*).
   2. Leaf not at all constricted above the sheath. . . . . 1. *B. Karatas*.
1. Inflorescence a spike-like panicle, definitely pedunculate.
   3. Petals ligulate, white-tomentose at apex. . . . . 2. *B. Pinguin*.
   3. Petals with a definite claw, glabrous, petal-blade broad, bright yellow. Trinidad, Venezuela, Colombia. . . . . (*B. chrysantha*).

1. **B. Karatas** L. Leaves densely rosulate, very narrowly triangular: inflorescence densely capitate, subconical, deeply immersed in the center of the leaf-rosette, densely ferruginous-tomentose throughout: floral bracts distinctly shorter than the sepals, linear-oblong, acute, spinulose-serrate: flowers 55 mm. long, passing indistinguishably into a short thick pedicel; sepals coriaceous, free, acute, entire, 22–25 mm. long; petals narrowly lanceolate, fleshy, glabrous, 30 mm. long, definitely exceeding the sepals, united for much less than half their length; ovary few-seeded; style thick, trigonous: berry 80 mm. long, 20 mm. thick, fusiform.—Sp. Pl. 285 (1753).

Demerara: Upper Demerara River, 1887, *Jenman 4105* (K, J).
[Mexico and the Antilles to Colombia and British Guiana.]

Terrestrial in open woods and rocky places throughout the colony according to Schomburgk.

2. **B. Pinguin** L. Plant 1.5–2.5 m. in diameter: leaves rosulate, narrowly triangular, whitish-tomentose below: inflorescence in a close narrow panicle, definitely pedunculate, densely white-tomentose throughout; floral bracts abruptly contracted from a broad base into a linear-involute blade 30–35 mm. long: flowers 50 mm. long; sepals coriaceous, densely pale-lepidote; petals narrowly linear-elliptic, 30 mm. long, densely white-tomentose at apex, connected for 7 mm. at base; ovary narrowly subellipsoid, many-seeded: mature berry yellow, minutely verrucose, 35 mm. long, 22 mm. thick, ovoid.—Sp. Pl. 285 (1753).

[Central America and the Antilles.]

Terrestrial and epiphytic, reported as general in the sandstone and savanna areas of the colony by Schomburgk and probably correctly so, although no specimens seen.

2. **ARAEOCOCCUS** Brongn.

Low herbs. Leaves appressed-lepidote. Inflorescence laxly paniculate, scapose. Flowers small, inconspicuous. Sepals connate for half their length, rounded, glabrous. Petals free, reflexed at anthesis, eligulate. Stamens shorter than the petals, filaments free, anthers longer than the filaments, pollen grains ellipsoid with a pore at either end. Ovary terete, glabrous, no epigynous tube, style longer than the petals, stigma-lobes scarcely twisted. Ovules few (up to 10), borne at the top of the placenta, long-caudate. Seeds narrowly ovoid-cylindric, acute at either end.—Ann. Sci. Nat. ser. 2, xv. 370 (1841).

Three species. Trinidad, Tobago, Guiana, Brazil.

1. **A. micranthus** Brongn. Leaves few, fasciculate, subpetiolate, spinulose-serrate, blades recurving, acute, 30–40 cm. long, 1 cm. wide: scape very slender, terete, erect; scape-bracts narrowly lanceolate, membranaceous, entire: inflorescence laxly subpyramidal, 15 cm. long, glabrous, its axes strongly geniculate, reddish: spikes laxly 3–8-flowered; floral bracts ovate, apiculate, 2–2.5 mm. long, spreading: flowers 5 mm. long, sessile; sepals 0.5–0.75 mm. long, suborbicular; petals 3–3.5 mm. long, with a short broad claw, abruptly acute; ovary subglobose, 2 mm. thick; ovules usually 2 in each cell: berry purple.—Ann. Sci. Nat. ser. 2, xv. 370 (1841).

Northwest District: Mt. Everard, 1922, *Cruz 1308* (NY); Pomeroon District: Pomeroon River, *Cruz 3199* (NY); Essequibo: Macouria River, 1886, *Jenman 2501* (K, J); Kamakusa, upper Mazaruni River, longitude about 59° 50′ W., 1923, *Cruz 4145* (G, NY); 1922, *Leng 389* (NY).

[Trinidad, Tobago, French and Dutch Guiana, the Amazon Basin.]

Epiphytic, general throughout the colony.

3. **WITTMACKIA** Mez.

Large showy herbs. Leaves rosulate, abruptly acute or rounded, closely serrate. Scape central, often decurved, its bracts membranaceous. Inflorescence laxly bipinnate, composed of several elongate laxly polystichous spikes. Floral bracts minute, narrowly acuminate. Sepals nearly or quite free, mucronate, the right side extended into a broad membranaceous wing. Petals free, narrowly acute, recurved at anthesis, eligulate. Ovary glabrous, sessile, epigynous tube short. Style longer than the stamens. Ovules crowded, obtuse. Berry dry,

scarcely changed from the ovary. Seeds many, curved, obtuse, naked. —Fl. Bras. iii. pt. 3, 274 (1891).

Four species. The Antilles and Costa Rica to Guiana and Brazil.

KEY TO SPECIES.

Flowers 17–18 mm. long. The Lesser Antilles to Trinidad and Tobago.....(*W. lingulata*).
Flowers 12 mm. long or less.....1. *W. odora*.

1. **W. odora** (Miq.) Mez. Leaves scarcely enlarged at base, 1 m. long, 5–10 cm. wide, finely appressed-lepidote throughout, rounded-apiculate, finely spinulose-serrate: scape stout, tomentose, scape-bracts membranaceous, lanceolate-acuminate, finely spinulose-serrate: branches of the inflorescence suberect to spreading, often arching, glabrous or slightly tomentose; primary bracts spreading, entire; floral bracts over 5 mm. long, ovate at base, acuminate, equaling or exceeding the ovary: flowers 12 mm. long, tapering at base; sepals free, glabrous, 6.5 mm. long including the terminal spine, 3 mm. broad; petals 7 mm. long, 1.5 mm. broad, acute; anthers 2 mm. long, narrowly elliptic, mucronate at apex; ovary glabrous, clavate. —Fl. Bras. iii. pt. 3, 277 (1891). *Bilbergia odora* Miq. in Linnaea, xviii. 377 (1844).

NORTHWEST DISTRICT: Yarikita Police Station, Junction of Yarikita and Amakura Rivers, 1920, *Hitchcock 17631* (G, NY).

[Costa Rica, Tobago, French and Dutch Guiana, northern Brazil.]

4. **ANANAS** Mill. PINEAPPLE.

Leaves densely rosulate, scarcely enlarged at base, acuminate-pungent, spinulose-serrate. Scape about equaling the leaves, spiny-bracted. Inflorescence densely strobiliform, often crowned with a tuft of sterile bracts. Flowers sessile, violet or red. Sepals free, obtuse, slightly asymmetric. Petals free, erect, ligulate. Stamens included, pollen grains ellipsoid, with 2 pores. Ovary coalescing with the bracts and axis to form a fleshy compound fruit, epigynous tube short. Ovules borne near top of cell. Berry sterile in cultivated forms.—Gard. Dict. Abr. ed. iv. (1754).

A single rather variable species, native of Brazil and probably also the Guianas but widely cultivated.

1. **A. sativus** Schultes f. Typical specimens small, with fruit only slightly fleshy; cultivated specimens quite large, with a succulent fruit and aborted ovules.—R. & S. Syst. vii. 1283 (1830). *Bromelia Ananas* L. Sp. Pl. 285 (1753). *Ananassa sativa* Lindl. in Bot. Reg. sub t. 1068 (1827).

DEMERARA: Christianburg, Demerara River, 1925, *Altson 160, 161* (K, J); Demerara River, 1898, *Jenman 7363* (J); BERBICE: Corentyne River, 1879,

Jenman 31 (K, J); Essequibo: Mazaruni River, *Jenman 7595* (K); Indefinite 1899, *Jenman 7592* (J).

Terrestrial in open woods throughout the colony. "The most important fibre plant used by the Indians" (Jenman). Called by the Indians "Crowia," "Crowa," or "Karoa."

5. **GRAVISIA** Mez.

Stemless plants with densely rosulate, linear, spinulose leaves. Scape central, large, its bracts entire. Inflorescence twice or thrice pinnate, many-flowered. Sepals free, erect, asymmetric, short-mucronate. Petals free, erect, bearing two coarsely crenate or deeply incised scales near the base. Stamens included, the first series alternate with the petals and free, the second more or less fused to the petals. Pollen grains with more than 5 pores. Ovary sessile, epigynous tube conspicuous. Ovules many, caudate, borne on the upper half of the placenta.—Fl. Bras. iii. pt. 3, 299 (1892).

Eight species. Antilles, Costa Rica, and northern South America.

Key to Species.

Terminal spines of the floral bracts much longer than the bracts themselves.....1. *G. brassicoides*.
Terminal spines much shorter than the floral bracts.....2. *G. aquilega*.

1. **G. brassicoides** (Bak.) Mez. 5 dm. high: leaves 4 dm. long, 65 mm. wide, rigid, the inner reddish, in a dense cabbage-like head (Jenman): scape slender, its bracts red, lanceolate, pungent: inflorescence densely bipinnate, subthyrsoid, of short-stipitate 3–5-flowered heads, 17 cm. long, 7 cm. wide; lower primary bracts like the scape-bracts, exceeding the axillary heads; floral bracts ovate, 9 mm. long, their terminal spines at least 12 mm. long: flowers 22 mm. long; sepals 11 mm. long, mucronate, carinate; petals yellow, 16 mm. long; ovary subclavate, not constricted at apex.—Mez in DC. Mon. Phan. ix. 173 (1896). *Aechmea brassicoides* Bak. in Journ. Bot. xx. 329 (1882).

Essequibo: Kaietur Savanna, Potaro River, 1881, *Jenman 957* (K, J, phot. G).

2. **G. aquilega** (Salisb.) Mez. Plant 1 m. or more high: leaves 1–1.5 m. long, 5–10 cm. wide: scape stout, densely white-farinose: inflorescence of 10–20 stipitate heads, interrupted-thyrsoid, 4 dm. long; primary bracts lanceolate, broad, reflexed, the lower ones much exceeding the axillary heads; floral bracts ovate, pungent, shorter than the sepals, glabrous: flowers 36 mm. long, glabrous; sepals 14 mm. long, pungent; petals mucronate, flavous; ovary 10 mm. long, trigonous.—Fl. Bras. iii. pt. 3, 300 (1892). *Bromelia aquilega* Salisb. Parad. Lond. t. 40 (1805). *B. surinamensis* Miq. in Linnaea, xviii. 378 (1844).

DEMERARA: Hooroobea, 1887, *Jenman 3826* (K, J).
[Venezuela, Trinidad, Tobago, Dutch Guiana, northern Brazil.]

Epiphytic.

6. **AECHMEA** R. & P.

Large or medium-sized stemless herbs. Leaves rosulate, usually linear. Scape conspicuous. Inflorescence of various types. Flowers usually sessile. Sepals often asymmetric, usually mucronate. Petals free, bearing two scales near the base or high up. Second series of stamens more or less joined to the petals. Pollen grains with 2 or 4 pores. Style shorter than the stamens, stigma lobes linear, often twisted. Ovules caudate or obtuse. Berry usually dry. Seeds small, rugose, dark-colored, naked.—Fl. Peruv. Prodr. 47, t. 8 (1794).

Apparently 120 to 130 species. Mexico and the Antilles to northern Argentina.

KEY TO SPECIES.

1. Inflorescence compound.
   2. Sides of the floral bracts joined to the rhachis: rhachis excavated: spikes distichous.
      3. Spikes sessile or nearly so ..... 1. *Ae. tillandsioides*.
      3. Spikes long-peduncled. Lesser Antilles to Tobago and Trinidad ..... (*Ae. dichlamydea*).
   2. Sides of the floral bracts not joined to the rhachis: rhachis not excavated.
      4. Sepals blunt, emarginate ..... **Ae. *fulgens*.*
      4. Sepals acute or mucronate.
         5. Floral bracts large, forming a tubular sheath around the ovary.
            6. Lower branches of the inflorescence sterile. Panama French Guiana, Amazon Basin ..... (*Ae. setigera*).
            6. Inflorescence fertile throughout: sepals mucronate.
               7. Sepals not over 4 mm. long, flowers small.
                  8. Leaf-blades linear, sheaths relatively small. 2. *Ae. humilis*.
                  8. Leaf-blades oblong, sheaths conspicuous. 3. *Ae. mucroniflora*.
               7. Sepals 5.5–6.5 mm. long, flowers large ..... 4. ***Ae. spicata***.
         5. Floral bracts minute, much shorter than the ovary, apiculate ..... 5. ***Ae. Melinonii***.
1. Inflorescence simple, spicate.
   9. Scape prominent: scales of the petals well developed.
      10. Sepals mucronate: inflorescence rather lax, appressed-lepidote to glabrous ..... 6. *Ae. nudicaulis*.
      10. Sepals blunt: inflorescence dense, densely white-lanuginose ..... 7. ***Ae. bromeliifolia***.
   9. Scape very short: scales on the petals rudimentary ... 8. *Ae. Fernandae*.

1. **Ae. tillandsioides** (Mart.) Bak. Leaves 4 dm. long, 2–4 cm. wide, spinulose-serrate, acuminate: scape slender, at first white-tomentose, its bracts lanceolate-acuminate, red, remote, serrate: inflorescence bipinnate, red; primary bracts like the scape-bracts; spikes distichous, 12-flowered or less, 7–9 cm. long, rhachis excavated; floral bracts ovate, concave, equaling the sepals, strongly nerved, glabrous, their sides

joined to the rhachis: flowers sessile, 20 mm. long; sepals 7.5 mm. long, free, pungent, slightly asymmetric; petals erect, 16 mm. long, scales slightly fimbriate; ovary subglobose, constricted at apex, epigynous tube conspicuous; ovules many, long-caudate, borne high in the ovary: berry blue, 4 mm. thick.—Journ. Bot. xvii. 134 (1879). *Billbergia tillandsioides* Mart. in R. & S. Syst. vii. 1269 (1830).

Demerara: Demerara River, 1896, *Jenman 6896* (K), *6913* (J); upper Demerara River, 1887, *Jenman 4116* (J); Essequibo: Rockstone, 1920, *Hitchcock 17288* (G).

[Central America and the Amazon Basin.]

Epiphytic.

2. **Ae. humilis** Mez. Scarcely over 2 dm. high: leaves few, bulbous-rosulate, 25 cm. long, sheaths ovate, relatively small, blades linear, 12 mm. broad, serrulate, acuminate: scape slender, erect, shorter than the leaves, bearing at its apex a tuft of reflexed lanceolate red remotely serrulate bracts: inflorescence 6 cm. long, 2 cm. thick, bipinnate, thyrsoid, glabrous; branches 2–5-flowered, spreading; floral bracts broad, asymmetric, mucronate: flowers 11 mm. long; sepals free, mucronate, asymmetric, 4 mm. long; petals erect, acute, 7 mm. long, yellow; ovary glabrous; ovules few.—Mez in DC. Mon. Phan. ix. 216 (1896).

Northwest District: Waini River, lat. 8° 20′ N., long. 59° 40′ W., 1923, *Cruz 3717* (G, NY); Demerara: Lama Creek, 1889, *Jenman 5120* (K, NY, phot. G); Essequibo: Mazaruni, *Appun 249* (K); Cuyuni River, 1904, *Bartlett 8397* (J); Rockstone, 1921, *Gleason 585* (NY), 1923, *Linder 35* (G); Kalacoon, junction of Mazaruni and Cuyuni Rivers, 1924, *Graham 121* (Carnegie Mus.); Rupununi District: upper Rupununi River, near Dadanawa, lat. 2° 45′ N., 1922, *Cruz 1467* (G, NY).

Epiphytic, general throughout the colony. Endemic.

3. **Ae. mucroniflora** Hook. Leaves bulbous-rosulate, 20 cm. long, sheaths ovate, conspicuous, blades oblong, 17–20 mm. wide, serrulate, acuminate: scape and inflorescence like that of *Ae. humilis:* flowers scarcely more than 15 mm. long; sepals free, mucronate, 4 mm. long; petals yellow; ovules few, caudate.—Hook. Bot. Mag. t. 4832 (1855).

Demerara: East Coast Water Conservancy, southeast of Georgetown, Lamaha Stop-off, 1919, *Hitchcock 16893 in part* (G); Essequibo: Mazaruni, *Appun 250* (K, phot. G).

[Trinidad, French and Dutch Guiana, Amazon Basin.]

Epiphytic.

4. **Ae. Mertensii** (Meyer) Schult. f. Leaves bulbous-rosulate, 3–6 dm. long, sheath large, ovate, blade 3–5 cm. wide, coarsely spinulose-serrate, abruptly acute, mucronate: scape erect, bearing at its apex a tuft of reflexed lanceolate red remotely serrulate bracts: inflorescence

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at first dense, often becoming lax at maturity, 5–20 cm. long, 4–5 cm. wide, branches densely 4–12-flowered; floral bracts broadly reniform, long-spinose, enfolding the ovary: flowers 12–17 mm. long; sepals free, mucronate, 6.5 mm. long; petals yellow, erect, mucronate, 11 mm. long, their scales fimbriate; ovary subclavate, glabrous, epigynous tube short but distinct; ovules few, long-caudate, borne high in the ovary.—Schult. f. in R. & S. Syst. vii. 1272 (1830). *Bromelia Mertensii* Meyer, Fl. Essequeb. 144 (1818). *Aechmea spicata* Mart. in R. & S. Syst. vii. 1273 (1830).

Pomeroon District: Kabakaburi, 1923, *Cruz 3281* (G, NY); Demerara: East Coast Water Conservancy, southeast of Georgetown, Lamaha Stop-off, 1919, *Hitchcock 16893 in part* (NY); Berbice: Maperma Creek, Corentyne River, Sept. 1879, *im Thurn* (K, phot. G); Essequibo: Massaruni, 1908, *Bartlett 8742* (J); Chinabourie Creek, Potaro River, Nov. 1907, *Bartlett* (J); Tumatumari, Potaro River, 1921, *Gleason 73* (NY); dry sandhills, east of Rockstone, 1921, *Gleason 747* (NY); Penal Settlement, 1919, *Hitchcock 17130* (G, NY); opposite Bartica, 1887, *Jenman 3814* (K, phot. G); Kaietur Savanna, Potaro River, 1881, *Jenman 853* (K, J, phot. G); Kurupung, upper Mazaruni, 1922, *Leng 222, 229* (NY); Kamakusa, upper Mazaruni, 1922, *Leng 348* (NY).

[Trinidad, French and Dutch Guiana, Amazon Basin.]

Epiphytic, general throughout the colony.

5. **Ae. Melinonii** Hook. Leaves 7 dm. long, sheath ovate-oblong, 20 cm. long, 12 cm. broad, blade linear, 5 cm. broad, abruptly acute, pungent, coarsely serrate: scape stout, its bracts lanceolate-triangular, entire, acuminate, stramineous: inflorescence paniculate, tripinnate, ovoid, 17 cm. long, 11 cm. thick, exceeding the leaves, branches geniculate, 4-flowered, short; floral bracts 4 mm. long, reniform, apiculate, glabrous: flowers 30 mm. long, red; sepals free, 10 mm. long, asymmetric, mucronate; petals 15 mm. long, rounded, scales incised; ovary usually clavate from a narrow base; ovules long-caudate, borne high in the ovary.—Bot. Mag. t. 5235 (1861). *Ae. Jenmani* Bak. Journ. Bot. xx. 329 (1882).

Demerara: upper Demerara River, 1887, *Jenman 4009* (NY), *4039* (K, J); Essequibo: Essequibo River, 1881, *Jenman 903* (K, J, phot. G).

[French Guiana.]

Epiphytic.

6. **Ae. nudicaulis** (L.) Griseb. Leaves 5 dm. long, 6–10 cm. broad above the narrow sheath, linear, apiculate, strongly spinulose-serrate: scape slender, erect or arching, white-floccose, its bracts erect, elliptic-acute, entire, red, membranaceous, congested at its apex: inflorescence simple, polystichous, cylindric, fertile throughout; floral bracts minute or sometimes wanting, entire: flowers 22 mm. long; sepals free, mucronate, strongly asymmetric; petals 12 mm. long, yellow, acute, bearing

fimbriate scales 4 mm. from base; ovary subglobose, epigynous tube conspicuous; ovules short-caudate, borne at the middle of the placenta.—Fl. West Ind. 593 (1864). *Bromelia nudicaulis* L. Sp. Pl. 286 (1753). *Bromelia lutea* Meyer, Fl. Esseq. 145 (1818). *Billbergia lutea* R. & S. Syst. vii. 1258 (1830).

DEMERARA: Demerara River, 1880, *Jenman 611* (J); near Georgetown, 1889, *Jenman 4839* (K); ESSEQUIBO: Kaietur Falls, *Appun* (fide Mez); Kamakusa, upper Mazaruni River, 1922, *Leng 345* (NY); INDEFINITE: Mt. Russell District, 1886, *Jenman 2107* (K, NY); no locality, *Parker* (K).

[Mexico and the Antilles to southern Brazil.]

Epiphytic, general throughout the colony.

7. **Ae. bromeliaefolia** (Rudge) Bak. Leaves 6–10 dm. long, 5 cm. broad above the large ovate sheath, linear, usually rounded by decay of the point, coarsely spinose-serrate: scape stout, densely white-lanate, its bracts ovate-lanceolate, entire, densely imbricate: inflorescence simple, polystichous, densely cylindric, 7–15 cm. long, 35 mm. wide, fertile throughout, densely white-lanate; floral bracts broader than long, truncate, thickened, keeled: flowers 17 mm. long; sepals 7 mm. long, joined at base for 2 mm., emarginate; petals 15 mm. long, erect, emarginate, greenish-yellow soon turning black, scales borne 5 mm. from the base, fimbriate; ovary tomentose; ovules borne high in the ovary, long-caudate.—Bak. in Benth. & Hook. f. Gen. iii. 664 (1883). *Tillandsia bromeliaefolia* Rudge, Pl. Guian. 32, t. 50 (1805). *T. vestita* Willd. in R. & S. Syst. vii. 1228 (1830). *Billbergia clavata* Lindl. in Bot. Reg. sub t. 1068 (1827). *Macrochordium bromeliaefolium* Beer, Brom. 146 (1857).

DEMERARA: upper Demerara River, 1887, *Jenman 4056* (K, J), *4153* (NY); BERBICE: Maperma Creek, Corentyne River, Sept. 1879, *im Thurn* (K); ESSEQUIBO: Kamakusa, upper Mazaruni River, 1922, *Leng 385* (NY); INDEFINITE: *Schomburgk 1025* (K).

[Venezuela, French and Dutch Guiana, Brazil.]

Terrestrial in sandy soil. According to Schomburgk widespread as an epiphyte in the forest regions.

8. **Ae. Fernandae** (Morr.) Bak. Leaves 1.5 m. long, 5 cm. wide above the narrow sheath, linear, spinulose-serrate, acuminate, pungent: scape short and thick, glabrous, its bracts serrate, wholly like the leaves: inflorescence simple, densely globose, 15 cm. thick, rhachis globose-thickened; floral bracts recurved, serrulate-crenate, much exceeding the flowers, scarlet: flowers 45 mm. long; sepals scarlet, 30 mm. long, thickened, acuminate, strongly keeled; petals greenish, erect, acuminate; ovary compressed, obscurely winged, 10 mm. long, epigynous tube conspicuous; ovules borne near the middle of the placenta.—Brom. 64 (1889). *Bromelia Fernandae* Morr. in Ill. Hort.

xviii. 114, t. 65 (1871). *Bromelia longifolia* Schomburgk, not Rudge, Fauna u. Fl. Br.-Guian. 903 (1848).

INDEFINITE: *Schomburgk* (fide Mez).
[Amazon Basin.]

Reported on the Essequibo and near Mt. Roraima by Schomburgk, but evidently no labelled specimens known.

7. **BILLBERGIA** Thunb.

Stemless plants. Leaves rosulate or rarely fasciculate, sheath large, blade linear, spinulose-serrate, often banded. Scape erect or arching, its bracts red, membranaceous. Inflorescence simple or compound. Flowers showy. Sepals free, erect, usually obtuse. Petals free, actinomorphic or zygomorphic, bearing two scales, claw long, blade elliptic. Stamens exserted at anthesis, both series free, or the second joined to the petals only as high as the scales. Pollen grains with longitudinal folds, but no pores. Style exceeding the stamens, epigynous tube large. Ovules many, obtuse.—Decad. Pl. Bras. iii. 30 (1823).

About 50 species. Chiefly Brazilian with outlying species in the rest of South America, Central America, and Trinidad.

KEY TO SPECIES.

1. Inflorescence cylindric: petals becoming spirally recurved at anthesis.
   2. Ovary densely verrucose. Trinidad and Dutch Guiana....(*B. rosea*).
   2. Ovary not at all verrucose.....1. *B. violacea*.
1. Inflorescence densely pyramidal: petals twisted, not spiral at anthesis.....2. *B. pyramidalis*.

1. **B. violacea** Beer. Leaves 70 cm. long, 2.5 cm. wide above the narrowly ovate sheath, blade remotely serrate, acute: scape slender, arching, densely white-farinose, its bracts lanceolate-acuminate: inflorescence simple, cylindric, 25 cm. long, 9 cm. broad, white-farinose; floral bracts ovate-acute, less than 3 mm. long: flowers obscurely short-pedicelled; 70 mm. long; sepals narrowly triangular, 14, 12 and 12 mm. long respectively; petals green, acuminate, spirally recurved, scales crenate; anthers 8 mm. long, linear, versatile; ovary 8 mm. long, sulcate, not verrucose, epigynous tube constricted.—Brom. 116 (1857).

INDEFINITE: *Appun* (fide Mez).
[French and Dutch Guiana.]

2. **B. pyramidalis** (Sims) Lindl. Leaves tubular-rosulate, 1 m. long, densely and finely spinulose-serrate, 6 cm. broad above the ovate base, often spotted: scape erect, white-farinose, its bracts lanceolate: inflorescence simple, pyramidal, 15 cm. long, white-farinose, rhachis

stout, straight; floral bracts minute, acute: flowers 65 mm. long, obscurely short-stipitate; sepals 17 mm. long, pale reddish, densely farinose; petals 52 mm. long, obtuse, red, twisted at anthesis, scales fimbriate; anthers 7 mm. long, linear; ovary subcylindric, densely farinose, epigynous tube short.—Bot. Reg. sub t. 1068 (1827). *Bromelia pyramidalis* Sims in Bot. Mag. t. 1732 (1815).

DEMERARA: Georgetown, 1908, *British Guiana Botanic Garden* (J).
[Eastern Brazil.]

Introduced in cultivation.

8. **BROCCHINIA** Schult. f.

Stem often woody. Leaves densely rosulate, very large, linear, entire, nearly or quite glabrous. Scape erect, glabrous, its bracts leaf-like. Inflorescence laxly many-pinnate, paniculate, branches racemose, polystichous. Floral bracts minute. Flowers minute, definitely pedicelled, greenish or white, Sepals small, free. Petals free, eligulate, blade suborbicular. Stamens included. Ovary almost wholly inferior, slender. Ovules few, long-caudate. Capsule subprismatic, septicidal. Seeds appendaged at both ends.—Schult. f. in R. & S. Syst. vii. p. lxx, 1250 (1830).

Four species. Savannas of northern Brazil, Guiana, and Venezuela.

KEY TO SPECIES.

Leaves few, areolate-veined: inflorescence tripinnate: ovary nearly or quite inferior.....1. *B. reducta.*
Leaves many, not at all areolate: inflorescence 5–6-pinnate: ¾ of the ovary inferior.....2. *B. micrantha.*

1. **B. reducta** Bak. Leaves few, erect, cylindric-clasping, 55 cm. long, 7 cm. broad above the dark brown sheath, blade rounded-apiculate, light green, areolate-veined: scape 5–7 dm. long, 5–7 mm. thick, terete, its bracts 30–35 mm. long, remote: inflorescence branches 13 cm. long, narrow, straight, long-stipitate; primary bracts ovate-apiculate, much shorter than the sterile base of the branch; floral bracts ovate-acute, 3 mm. long: flowers erect or nearly so, short-pedicelled, 5 mm. long; sepals ovate-elliptic, apiculate, glabrous, about equaling the petals; petals with claw obscure; ovary minutely tomentose.—Journ. Bot. xx. 331 (1882). *B. hechtioides* Mez in Fedde, Rep. Spec. Nov. xii. 414 (1913).

ESSEQUIBO: Mt. Warima, *Schomburgk* (K); Kaietur Savanna, Potaro River, 1881, *Jenman 873* (K, J, phot. G); Roraima Range, alt. 1100–1200 m., 1898, *McConnell & Quelch 702* (K, J, NY); alt. 1400 m., 1928, *Tate 257* (NY, phot. G); alt. 1700 m., 1909, *Ule 8561* (Berlin, fide Mez).
[Mt. Duida, Venezuela.]

Quickly distinguished from all other species of *Bromeliaceae* within the colony on account of its areolate-veined leaves. *B. hechtioides* has not been examined, but it seems very doubtful from its description that it can be of specific rank.

2. **B. micrantha** (Bak.) Mez. Very large, stem thick, woody, 1 m. or more high: leaves many, 1 m. long, 20 cm. wide above the dark brown sheath, rounded-apiculate, not areolate: scape stout: inflorescence 5–6-pinnate, 2 m. long, lower branches 6 dm. long; primary bracts lanceolate-acuminate; floral bracts 1 mm. long, lanceolate-acuminate, spreading: flowers whitish, 5 mm. long, short-stipitate, suberect; sepals 3 mm. long, rounded; petals 4 mm. long, emarginate, definitely clawed; ovary ¾ inferior, glabrous: capsule 8 mm. long; seeds few, 2 mm. long, compressed, with an encircling wing elongated at either end, 7 mm. long.—Fl. Bras. iii. pt. 3, 464 (1894). *Cordyline micrantha* Bak. in Gard. Chron. New Series, xiv. pt. 2, 243, t. 47 (1880). *Brocchinia cordylinioides* Bak. in Journ. Bot. xx. 330 (1882).

Essequibo: Kaietur Savanna, *Appun* (fide Mez); July 1879, *im Thurn* (K, phot. G); 1881, *Jenman 1196* (K, J, phot. G).

9. **PITCAIRNIA** L'Hérit.

Plants usually stemless. Leaves fasciculate, entire or spinulose-serrate, sheath small, often bulbous-thickened, blade linear to lanceolate with definite petiole, sometimes dimorphic with some blades reduced to horny spinulose-serrate spines. Inflorescence simple or compound, racemose. Sepals free, acute but never mucronate. Petals free, usually zygomorphic, eligulate or with a single triangular scale at base. Stamens equaling or shorter than the petals, anthers linear, versatile. Ovary usually superior for most of its length, style filiform, equaling the petals. Ovules many. Capsule septicidal or rarely indehiscent. Seeds appendaged at either end or rarely with a dorsal wing.—Sert. Angl. 7, t. 11 (1788).

About 170 species. Terrestrial or saxicolous, rarely epiphytic. Central America, the Antilles, and South America south to northern Argentina.

Key to Species.

1. Flowers slender, pedicelled: floral bracts small, usually much exceeded by the sepals.
   2. Capsule indehiscent, ovary ¾ inferior: inflorescence simple, racemose.
      3. Leaves definitely narrowed above the sheath.
         4. Leaf-blade distinctly petioled.
            5. Leaf densely red-tomentose below, not over 4 cm. broad. French Guiana ..... (*P. rubiginosa*).
            5. Leaf pale-lepidote, 6–8 cm. broad ..... 1. *P. Leprieurii*.

4. Leaf-blade not distinctly petioled, not over 3 cm. wide. 2. *P. incarnata.*
3. Leaves linear, scarcely if at all narrowed above the sheath 3. *P. Kegeliana.*
2. Capsule dehiscent, ovary more than half superior: inflorescence paniculate ..... 4. *P. nuda.*
1. Flowers stout, short-pedicelled or sessile: floral bracts equaling or exceeding the sepals: inflorescence simple.
6. Flowers definitely pedicelled ..... 5. *P. Funckiana.*
6. Flowers sessile ..... **P. Altensteinii.*

1. **P. Leprieurii** Bak. Leaves dimorphic, some ovate-triangular and sessile, others definitely petioled from a triangular sheath, blade lanceolate, 1 m. long, 6–8 cm. wide, entire or minutely serrate, petiole grooved, coarsely spinose-serrate: scape much shorter than the leaves, stout, its bracts lanceolate-acuminate: inflorescence a simple raceme, 40 cm. long, puberulent; floral bracts lanceolate-acuminate, suberect, exceeding the pedicels: flowers 5–6 cm. long, pedicels 13 mm. long; sepals linear, rounded, 24 mm. long, keeled; petals red, scale bidentate; inferior part of the ovary 7 mm. long, obconical.—Brom. 117 (1889).

DEMERARA: Georgetown, 1888, *British Guiana Botanical Garden* (J, phot. G). [French Guiana.]

In cultivation, but probably native also.

2. **P. incarnata** Bak. Leaves all alike, remotely spinulose-serrate, narrowed above the long-triangular sheath but not definitely petioled, blade 5–8 dm. long, 2–3 cm. broad, linear-lanceolate, caudate-acuminate: scape much shorter than the leaves, its bracts lanceolate, long-acuminate, exceeding the internodes: inflorescence a simple raceme, 16 cm. long, puberulent; floral bracts like the scape-bracts, exceeding the pedicels: flowers 5 cm. long, pedicels 10–16 mm. long; sepals subtriangular, 16 mm. long, scarcely keeled, deep yellow; petals acute, red, scale irregularly crenate, bidentate; ovary ¾ inferior: capsule indehiscent, broadly fusiform, 17 mm. long; seeds with narrow dorsal wing.—Brom. 116 (1889). *P. semijuncta* Bak. Brom. 117 (1889).

INDEFINITE: Camounie Creek, 1883, *Jenman 2041* (K, J, phot. G). [French Guiana.]

3. **P. Kegeliana** Schdl. Leaves all alike, linear, not definitely narrowed above the sheath, 6–8 dm. long, 13 mm. broad, minutely spinulose-serrate: scape erect, slender, scape-bracts narrowly lanceolate, filiform-caudate, at least the lower ones much exceeding the internodes: inflorescence a simple few–several-flowered raceme, more or less secund, white-farinose, rhachis nearly or quite straight; floral bracts ovate-lanceolate, the lower ones often long-caudate and equaling the ovary:

flowers slender, 4–5.5 cm. long, pedicels 6 mm. long; sepals narrowly triangular, 15 mm. long, ecarinate; petals rounded, 4 cm. long, scarlet, ligulate; ovary ellipsoid, almost wholly inferior.—Schdl. in Linnaea, xxiv. 664 (1851). *P. pauciflora* Bak. in Journ. Bot. xix. 230 (1881). *P. subjuncta* Bak. Brom. 116 (1889).

Pomeroon District: Pomeroon River, 1923, *Cruz 2997* (G, NY); Demerara: Malali, Demerara River, lat. about 5° 35′ N., 1922, *Cruz 2744* (G, NY); Berbice: Marlissa crossline, Berbice River, 1919, *Abraham 250* (NY); Essequibo: Kamakusa, upper Mazaruni River, long. about 59° 50′ W., 1922, *Cruz 2830* (G, NY); Kaietur Falls, Potaro River, 1923, *Cruz 4457* (G, NY); Kurupung, upper Mazaruni River, 1922, *Leng 317* (NY); Rupununi: Quitara River, 1838, *Schomburgk 585* (K, phot. G).
[French and Dutch Guiana.]

Epiphytic and terrestrial, general throughout the colony.

4. **P. nuda** Bak. Leaves narrowly triangular, not constricted above the sheath, coarsely spinose-serrate, pungent, glabrous: scape stout, erect, glabrous, its bracts narrowly triangular, pungent, serrate, the upper ones shorter than the internodes: inflorescence bipinnate, 5 dm. long, 2.5 dm. wide, glabrous; branches 2 dm. long, lax, bearing 6–12 secund pendulous flowers; floral bracts much shorter than the pedicels, enfolding them at base; pedicels slender, 2 cm. long: sepals narrowly triangular, 37 mm. long; petals red, eligulate; ovary almost wholly superior: seeds flattened with a single encircling wing.—Journ. Bot. xix. 269 (1881).

Rupununi (?): Rapunnunie, *Appun 1582* (K, phot. G).
[Dutch Guiana, Venezuela.]

5. **P. Funckiana** A. Dietr. Leaves entire, dimorphic, the outer ovate-triangular, sessile, the inner definitely petioled from the narrow sheath, blade lanceolate, 6 dm. long, 0.5 dm. wide: scape erect, scantly furfuraceous, its bracts lance-acuminate, imbricate: inflorescence a simple lax raceme, 20 cm. long, 8 cm. broad; floral bracts broadly ovate, 3 cm. long, exceeding the sepals, spreading: flowers 65 mm. long, pedicels short but slender, glabrous; sepals yellowish green, obtuse, lanceolate, asymmetric, 35 mm. long; petals whitish, eligulate; ovary $\frac{4}{5}$ superior: seeds long-caudate.—A. Dietr. in Otto & Dietr. Allg. Gartenz. xix. 337 (1851).

Indefinite: *Schomburgk* (fide Mez).
[Colombia.]

10. **PUYA** Molina.

Perennial, usually long-caulescent, often several metres high. Leaves densely rosulate, coarsely spinose-serrate, rarely entire or with rudimentary teeth. Inflorescence various. Flowers showy.

Sepals free, much shorter than the petals. Petals free, usually spreading at anthesis, eligulate but sometimes with vertical folds. Stamens nearly or quite included, filaments free. Ovary wholly superior, glabrous. Style slender, elongate. Capsule loculicidal, or septicidal, or both together forming six divisions. Seeds many, each with a single dorso-apical wing.—Saggio Chile, 160, 351 (1782).

From 70 to 80 species. Chiefly in the Andes, with outlying species in the mountains of Costa Rica and Guiana and the plains of northern Argentina.

Key to Species.

1. Inflorescence an open panicle: leaves coarsely spinose-serrate . 1. *P. floccosa.*
1. Inflorescence densely cylindric.
2. Inflorescence compound, several flowers in the axil of each bract . . . . . 2. *P. Augustae.*
2. Inflorescence simple, a single flower in the axil of each bract. 3. *P. Quelchii.*

1. **P. floccosa** (Regel) Morr. Short-caulescent, 1 m. or more high: leaves many, over 1 m. long, 3 cm. broad above the sheath, coarsely spinose-serrate, densely lepidote below: scape stout, white-tomentose, its bracts lance-acuminate, spinose-serrate, densely imbricate: inflorescence laxly bipinnate, 8 dm. long, much exceeding the leaves, densely white-tomentose throughout; branches straight or nearly so, 6–12-flowered; primary bracts serrate; floral bracts ovate-apiculate, much shorter than the sepals, entire: flowers short-pedicelled, 45 mm. long; sepals acuminate, 33 mm. long, densely tomentose; petals blue, naked: capsule 14 mm. long, broadly ovoid, acute, loculicidal; seeds 3 mm. long.—Morr. in Belg. Hort. xxxv. 81 (1885). *Pitcairnia floccosa* Regel in Act. Hort. Petrop. iii. 124 (1875). *Puya guianensis* Kl. in Schomburgk, Fauna u. Fl. 1067 (1848), nomen nudum.

Essequibo: Roraima, lower slope, 1884, *im Thurn 45* (K, J, phot. G); Roraima Range, alt. 1100–1200 m., 1898, *McConnell & Quelch 701* (K, J, NY). [Venezuela, Colombia, Bolivia.]

2. **P. Augustae** (Schomburgk) Mez. Stemless, 4 dm. high: leaves 3 dm. long, 3.5 cm. wide, tapering, obtuse, entire above, bearing a few rudimentary teeth near the base: scape stout, glabrous, its bracts leaf-like below, above ovate or ovate-lanceolate, acute, reddish-brown, lustrous, densely imbricate: inflorescence densely ellipsoid, obscurely bipinnate, 12 cm. long, 6 cm. broad; primary bracts like the upper scape-bracts, entire, much exceeding the flowers; branches rudimentary, flowers clustered; floral bracts lanceolate, 20 mm. long: flowers 26 mm. long, pedicels stout, 10 mm. long; sepals elliptic, 12 mm. long, sparingly lepidote, lustrous; petals violet, naked: capsule ovoid, 12 mm. long exclusive of the long beak; seeds many, narrow, 2 mm. long

exclusive of the narrow wing produced at each pole.—Mez in DC. Mon. Phan. ix. 487 (1896). *Encholirium Augustae* Schomburgk in Verh. Preuss. Gartenb. Ver. 18, t. 2 (1846). *Connellia Augustae* N. E. Brown in Trans. Linn. Soc. ser. 2, vi. 66, t. 13 (1901).

Essequibo: Mt. Roraima, *Schomburgk 687* (K, phot. G), *1021* (fide N. E. Brown); summit of Mt. Roraima, alt. 2800–2900 m., 1898, *McConnell & Quelch 670* (K).

3. **P. Quelchii** (N. E. Brown) L. B. Smith. Short-caulescent, 15–25 cm. tall: leaves erect, 6–14 cm. long, with a few rudimentary teeth near the base, 6 mm. broad above the broadly ovate sheath, blade narrowly triangular, involute, thick, rigid, densely spreading-tomentose above, soon glabrous below: scape erect, glabrous, its bracts entire, leaf-like below, above broadly ovate, apiculate, reddish brown, lustrous: inflorescence a dense simple raceme, 5–12 cm. long, glabrous throughout; floral bracts like the upper scape-bracts, exceeding the pedicels: flowers 20 mm. long, pedicels slender, 15 mm. long; sepals 16 mm. long, 8 mm. broad, center red-brown, lustrous, margin pale, submembranaceous; petals bright rose-pink, naked, blade obovate; ovary ovoid, ovules caudate.—L. B. Smith, see page 7. *Connellia Quelchii* N. E. Brown in Trans. Linn. Soc. ser. 2, vi. 67, t. 14 (1901). *Puya roraimae* Mez in Fedde, Rep. Spec. Nov. xii. 417 (1913).

Essequibo: Summit of Mt. Roraima, 1884, *im Thurn 315* (K, J); 1894, *McConnell & Quelch 107* (K, phot. G), 1898, *672* (K, J, phot. G); alt. 2400 m., 1910, *Ule 8557* (Berlin, fide Mez).

11. **LINDMANIA** Mez.

Low herbs. Leaves entire or remotely serrate. Scape erect, slender. Inflorescence a lax panicle, twice or thrice pinnate, floral bracts small. Flowers minute, whitish or green. Sepals free, scale-like. Petals twice as long as the sepals, free, naked, elliptic. Ovary superior, glabrous, style slender, equaling the stamens. Capsule septicidal or loculicidal. Seeds narrowly fusiform, with narrow dorsal wing caudate-produced at the ends.—Mez in DC. Mon. Phan. ix. 535 (1896)

Eleven species. Terrestrial. Chiefly Andean with outlying species in Salvador, Guiana, and Argentina.

1. **L. guianensis** (Beer) Mez. Sometimes 8 dm. high or often much less: leaves 3 dm. long, erect, entire, involute-subulate from a narrowly ovate sheath, rigid: scape glabrous, its bracts narrowly triangular, much shorter than the internodes: inflorescence 3 dm. long, much exceeding the leaves, few-flowered, bipinnate, glabrous; branches polystichous-flowering; primary bracts like the scape-bracts, minute: flowers 10 mm. long, spreading, glabrous; sepals 4 mm. long; stamens

shorter than the petals.—Mez in DC. Mon. Phan. ix. 537 (1896). *Anoplophytum guianense* Beer, Brom. 44 (1857).

BERBICE: upper Corentyne River, *Schomburgk 20* (K, phot. G), *1564* (fide Mez).

12. **NAVIA** Schult. f.

Low appressed herbs. Leaves many, densely rosulate, acuminate. Scape short or none. Inflorescence of one or more densely glomerate heads. Bracts membranaceous. Flowers sessile, white or greenish. Sepals acute, glabrous, membranaceous. Petals naked, spreading. Ovary superior, glabrous. Style elongate. Ovules few, globose, naked. Seeds naked, longitudinally sulcate.—Schult. f. in R. & S. Syst. vii. p. lxv, 1195 (1830).

Five species. Terrestrial. Venezuela, Guiana, and northwestern Brazil.

KEY TO SPECIES.

Leaves definitely serrate.....1. *N. angustifolia.*
Leaves appearing entire.....2. *N. Gleasonii.*

1. **N. angustifolia** (Bak.) Mez. Stemless, 5 cm. high: leaves 37 cm. long, 15 mm. broad, linear, finely spinulose-serrate, glabrous: inflorescence capitate, sunk in the center of the leaf-rosette; primary bracts triangular, serrulate, glabrous, reddish brown: sepals oblong-acute, 19 mm. long, compressed-carinate: capsule ellipsoid-acute, 13 mm. long, indurated.—Mez in DC. Mon. Phan. ix. 553 (1896). *Cryptanthus angustifolius* Bak. Brom. 15 (1889).

INDEFINITE: Marima, *Appun 1055* (K, phot. G).

2. **N. Gleasonii** L. B. Smith. Short-caulescent: leaves linear, 20 cm. long, 5 mm. wide, with very rudimentary teeth near the base, appearing entire, glabrous: inflorescence capitate, sunk in the center of the leaf-rosette; primary bracts ovate-oblong, entire, reddish brown: flowers 2 cm. long, white; sepals 1 cm. long, joined for 7 mm.; ovary 3 mm. long, narrowly ellipsoid.—L. B. Smith, see page 7.

INDEFINITE: Maceba Falls, Karatung River, 1925, *Altson 338* (K, phot. G).

13. **VRIESIA** Lindl.

Large showy herbs. Leaves densely rosulate, often banded or mottled, entire. Inflorescence various, spikes usually distichous-flowered. Floral bracts conspicuous, enfolding or concealing the bases of the flowers. Flowers with short stout pedicels, fugacious. Sepals free. Petals free, ligulate, scales usually two on the inside of each petal and entire. Ovary nearly or quite superior, style elongate.

Ovules many, usually caudate. Seeds fusiform, with a long coma.—Lindl. in Bot. Reg. t. 10 (1843).

About 100 species. Epiphytic, rarely terrestrial. Chiefly Brazilian with outlying species from Central America and the Antilles to Argentina.

KEY TO SPECIES.

1. Inflorescence simple or rarely digitate with 2 or 3 spikes.
  2. Inflorescence pendent, lax: flowers spreading. Brazil, Venezuela.....(*V. simplex*).
  2. Inflorescence erect.
    3. Floral bracts imbricate at maturity.
      4. Floral bracts spreading from the middle. Colombia, Dutch Guiana.....(*V. heliconioides*).
      4. Floral bracts erect throughout.
        5. Spike 3–6 cm. broad.
          6. Floral bracts acute.
            7. Floral bracts scarlet throughout, strongly incurved.....1. *V. splendens.*
            7. Floral bracts yellowish green, apex and margins reddish, slightly incurved.....2. *V. longibracteata.*
          6. Floral bracts obtuse.....3. *V. pachychlamys.*
        5. Spike not over 2 cm. broad, elongate, often 2 or 3 spikes. Trinidad, South America (indefinite).(*V. chrysostachys*).
    3. Floral bracts spreading at maturity.
      8. Mature capsules reflexed. Antilles, Brazil.....(*V. platynema*).
      8. Mature capsules merely spreading. Antilles, Venezuela (*V. macrostachya*).

1. Inflorescence definitely paniculate.
  9. Spikes polystichous-flowered. Trinidad.....(*V. stenostachya*).
  9. Spikes distichous or secund.
    10. Flowers secund. French Guiana, Brazil.....(*V. gigantea*).
    10. Flowers distichous, remote, spreading.....4. *V. procera.*

1. **V. splendens** (Brongn.) Lem. Stemless, 1 m. high or less: leaves linear, rounded-apiculate, 40 cm. long, 6 cm. wide, transversely dark-banded: scape erect, its bracts broadly ovate, acute or apiculate, densely imbricate: inflorescence simple, narrowly lanceolate, densely many-flowered; floral bracts 8 cm. long, strongly carinate, acute, much exceeding the sepals, scarlet throughout, strongly incurved: flowers 67 mm. long, pedicels 4 mm. long; sepals 25 mm. long, yellowish, often scarlet-tinged at apex; petals yellow, scales rounded: coma white.—Lem. in Fl. d. Serres, vi. 162 (1850–51). *Tillandsia splendens* Brongn. in Fl. d. Serres, ii. Mai, t. 4 (1846).

INDEFINITE: *Schomburgk* (fide Mez).
[French Guiana.]

2. **V. longibracteata** (Bak.) Mez. Very similar to the preceding species: floral bracts lanceolate, acute, greenish with apex and margins reddish, slightly or not at all incurved; pedicels 7 mm. long.—Mez in DC. Mon. Phan. ix. 568 (1896) as *longebracteata*. *Tillandsia*

longibracteata Bak. in Journ. Bot. xxvi. 81 (1888). *T. Appuniana* Bak. Brom. 213 (1889).

Essequibo: Kaietur Falls, 1872, *Appun* (Br. M., phot. G); Anandabaru, Kopinang River, in forest, alt. 600 m., 1926, *Altson 498* (K); Indefinite: on rocks, Karatung Mountains, alt. 300 m., 1925, *Altson 377* (K, phot. G).
[Trinidad, Venezuela.]

3. **V. pachychlamys** Mez. About 7 dm. high: leaves 8 dm. long, 6 cm. broad, linear, rounded-apiculate, green, glabrous: scape stout, its bracts broadly elliptic, apiculate, slightly exceeding the internodes: inflorescence simple, linear-oblong, 17-flowered, 3 dm. long; floral bracts erect, broadly ovate, rounded, ecarinate, imbricate, at first distichous, rugulose when dry, 5 cm. long, much exceeding the sepals: flowers secund.—Mez in DC. Mon. Phan. ix. 594 (1896), as *Vriesea*.

Indefinite: Camounie Creek, 1883, *Jenman 2044* (J, phot. G).

4. **V. procera** (Mart.) Wittm. Fully 1 m. or more high: leaves 4 dm. long, sublinear, 6 cm. wide above the large ovate sheath, rounded-apiculate, glabrate, green: scape-bracts leaf-like, mostly exceeding the internodes: inflorescence laxly paniculate, its branches flexuous, slender; floral bracts 28 mm. long, shorter than the sepals, elliptic, acute, ecarinate, enfolding the base of the flower: flowers spreading, remote, 35 mm. long; sepals oblong, rounded; petals yellow, scales lanceolate: coma brownish.—Wittm. in Engl. Bot. Jahrb. xiii. Beibl. 29, 21 (1891), as *Vriesea*. *Tillandsia procera* Mart. in R. & S. Syst. vii. 1224 (1830). *Vriesia gracilis* Gaud. Voy. Bonite Atl. t. 67 (1846).

Demerara: Horroobea and Lama, 1887, *Jenman 3828* (J, phot. G).
[Dutch Guiana, Brazil.]

14. **CATOPSIS** Griseb.

Stemless herbs. Leaves densely utriculate-rosulate, entire, minutely appressed-lepidote, green, sheath large, ovate. Scape conspicuous. Inflorescence usually bipinnate, rarely simple or tripinnate, exceeding the leaves, its branches polystichous-flowering. Flowers small or minute, sessile, perfect or dioecious. Sepals free, usually rounded, strongly asymmetric, glabrous. Petals free, naked. Stamens included, anthers ovate or elliptic. Ovary superior, broadly ovoid or ellipsoid in the perfect or fertile flowers, style shorter than the ovary or absent. Ovules few-several, long-caudate. Capsule septicidal. Seeds with coma folded over, their bases projecting from the capsule.—Griseb. in Goett. Nachr. 1864. 21 (1865).

Twenty-five species. Chiefly in Central America and the Antilles, with outlying species in Florida, northern South America, the Andes, and southern Brazil.

Key to Species.

1. Leaves acute or acuminate.
   2. Inflorescence definitely paniculate: sepals not over 12 mm. long.
      3. Scape-bracts and primary bracts ovate-acute: sepals 12 mm long. ..... 1. *C. Berteroniana.*
      3. Scape-bracts and primary bracts narrowly lanceolate, acuminate: sepals 6 mm. long. Antilles, Trinidad, Central America ..... (*C. nutans*).
   2. Inflorescence simple or at most of 2 or 3 spikes: sepals 15 mm. long or more. Central America, Antilles, Venezuela, Colombia ..... (*C. fulgens*).
1. Leaves rounded-mucronate.
   4. Style short but definite ..... 2. *C. sessiliflora.*
   4. Style none. Costa Rica, Antilles, Dutch Guiana ..... (*C. nitida*).

1. **C. Berteroniana** (Schult. f.) Mez. About 8 dm. high: leaves 3 dm. long, blade 5 cm. broad, subtriangular, acuminate: scape erect, its bracts lance-ovate below, broadly ovate above, equaling or exceeding the internodes: inflorescence laxly bipinnate, 30 cm. long, 12 cm. wide; spikes long-stipitate, 6–30-flowered; primary bracts ovate-apiculate, much shorter than the sterile base of the spikes; floral bracts suborbicular, 8 mm. long: flowers perfect, suberect; sepals 12 mm. long, exceeding the petals, strongly asymmetric, even, yellowish; petals white, ovate-elliptic; style ⅓ as long as the ovary, ovary broadly ellipsoid: coma pale brown.—Mez in DC. Mon. Phan. ix. 621 (1896). *Tillandsia Berteroniana* Schult. f. in R. & S. Syst. vii. 1221 (1830).

Essequibo: below the Kaietur, Potaro River, 1881, *Jenman 971* (K); Indefinite: *Parker* (K).

[Florida, British Honduras, the Antilles.]

2. **C. sessiliflora** (R. & P.) Mez. From 2 to 4 dm. high: leaves tubular-rosulate, 15 cm. long, blade sublinear, 22 mm. wide, rounded-apiculate: scape erect, its bracts remote: inflorescence simple or of only a few spikes, rhachis straight; floral bracts shorter than the sepals: flowers perfect, suberect, 10 mm. long; sepals suborbicular, 7.5 mm. long; petals ovate-lanceolate, slightly exceeding the sepals, white; style short but distinct; ovary large, ovoid.—Mez in DC. Mon. Phan. ix. 625 (1896). *Tillandsia sessiliflora* R. & P. Fl. Per. iii. 42, t. 271, fig. b (1802).

Essequibo: Mazaruni River, 1890, *Jenman 6244* (K, J); Indefinite: 1922, *Dahlgren & Persaud* (Field Mus.).

[Mexico and the Antilles to Peru and eastern Brazil.]

15. **TILLANDSIA** L.

Caulescent or acaulescent herbs, habit very variable. Leaves rosulate or fasciculate or evenly distributed along a stem, polystichous

or distichous, entire, usually subtriangular. Scape usually distinct. Inflorescence various, usually of distichous spikes, if spikes polystichous then single, rarely reduced to a single flower. Flowers perfect. Sepals usually symmetric, free, or equally or posteriorly joined. Petals free, naked. Stamens of various lengths relative to the petals and to the pistil. Ovary superior, glabrous. Ovules usually many and caudate. Capsule septicidal. Seeds erect, narrowly cylindric or fusiform, coma white, straight.—Sp. Pl. 286 (1753).

About 350 species. Tropical and subtropical America, from the southern United States, Central America and the Antilles, to northern Argentina and Chile.

KEY TO SPECIES.

1. Leaves polystichous: inflorescence simple or compound.
   2. Spikes distichous-flowered: inflorescence simple or compound.
      3. Sepals oblong or obovate, asymmetric, free.
         4. Leaves ligulate, rounded-apiculate: floral bracts equaling the sepals.
            5. Inflorescence bipinnate, spikes 8 cm. long or more: floral bracts 7 mm. long.....1. *T. triticea*.
            5. Inflorescence tripinnate or if bipinnate the spikes not over 6 cm. long: floral bracts scarcely more than 4 mm. long. Trinidad, Venezuela.....(*T. micrantha*).
         4. Leaves narrowly triangular, acuminate: floral bracts much shorter than the sepals.
            6. Primary bracts small, mostly shorter than the sterile bases of the spikes.....2. *T. Jennani*.
            6. Primary bracts conspicuous, at least half as long as the axillary spikes. Antilles, Venezuela.....(*T. Fendleri*).
      3. Sepals ovate or lanceolate, symmetric.
         7. Flowers remote: floral bracts shorter than the internodes.
            8. Flowers erect, appressed to the rhachis.
               9. Floral bracts exceeding the sepals. Dutch Guiana. (*T. adpressiflora*).
               9. Floral bracts shorter than the sepals. Florida, Antilles, Mexico, Venezuela.....(*T. utriculata*).
            8. Flowers spreading.....3. *T. aloifolia*.
         7. Flowers usually crowded: floral bracts always longer than the internodes.
            10. Leaves fasciculate, their blades filiform: inflorescence congested.
               11. Inflorescence shorter than the leaves, sparsely lepidote. Antilles, Venezuela, Brazil.....(*T. tenuifolia*).
               11. Inflorescence exceeding the leaves, densely pale-lepidote. Antilles, Trinidad, Mexico, Venezuela.(*T. juncea*).
            10. Leaves rosulate, their blades narrowly triangular to ligulate.
               12. Leaf-bases inflated, forming a pseudobulb.
                  13. Scantly appressed-lepidote throughout: scape definite: spikes narrow.....4. *T. bulbosa*.
                  13. Pruinose-lepidote throughout: scape none: spikes broad. Antilles, Colombia, Ecuador, Venezuela, Brazil.....(*T. pruinosa*)

12. Leaf-bases not markedly inflated.
14. Floral bracts densely imbricated, concealing the rhachis.
15. Floral bracts firm.
16. Inflorescence a densely congested ovoid panicle.
17. Leaves and bracts reddish, appressed-lepidote.....5. *T. Turneri.*
17. Leaves and bracts green, pruinose-lepidote. Venezuela, Trinidad, Brazil..(*T. Gardneri*).
16. Inflorescence simple or open.
18. Inflorescences several from one leaf-rosette, each with a single spike..6. *T. complanata.*
18. Inflorescences only one to each plant.
19. Floral bracts not over 16 mm. long: plant about 5 dm. high. Antilles, Central America, Brazil.....(*T. polystachya*).
19. Floral bracts 25 mm. long or more: plants large.
20. Inflorescence simple or digitate.
21. Sepals much joined posteriorly. Florida, Antilles, Central America, Colombia.....(*T. fasciculata*).
21. Sepals all nearly or quite free.
22. Sepals winged on the back. Dutch Guiana, Central America.....(*T. punctulata*).
22. Sepals merely keeled. Trinidad, Dutch Guiana.....(*T. compressa*).
20. Inflorescence paniculate: spikes very large. Antilles, Central America, Colombia, Ecuador, Peru, Venezuela.....(*T. paniculata*).
15. Floral bracts fleshy, becoming membranous on drying: inflorescence simple: floral bracts strongly incurved. Dutch Guiana, Panama.....(*T. Kegeliana*).
14. Floral bracts not concealing the rhachis.
23. Flowers spreading: inflorescence simple..7. *T. monadelpha.*
23. Flowers erect or ascending.
24. Floral bracts equaling the sepals, even .8. *T. rhododactyla.*
24. Floral bracts exceeding the sepals.
25. Sepals much joined posteriorly. Antilles, Colombia, Venezuela.....(*T. Valenzuelana*).
25. Sepals all free.
26. Inflorescence amply paniculate: floral bracts 20 mm. long. Trinidad, Colombia, Panama.....(*T. subimbricata*).
26. Inflorescence simple or digitate from a few spikes: floral bracts 27 mm. long. Venezuela, Antilles.....(*T. incurva*).
2. Spikes polystichous-flowered: inflorescence simple.
27. Sepals all nearly free.....9. *T. stricta.*
27. Posterior sepals much joined. Antilles, Venezuela, Brazil.....(*T. pulchella*).
1. Leaves distichous: inflorescence simple, very small.
28. Spikes terminal, several-flowered.....10. *T. recurvata.*
28. Spikes appearing axillary, reduced to a single flower..11. *T. usneoides.*

1. **T. triticea** Burch. Stemless, 4–7 dm. high: leaves 3 dm. long, densely and minutely appressed-lepidote, usually dark-spotted, 3 cm. broad above the broadly ovate dark brown sheath, abruptly acute, apiculate: scape erect, glabrous, its bracts narrowly ovate, acute, exceeding the internodes: inflorescence distichous, laxly bipinnate, glabrous, 2–3 dm. long; branches spreading; primary bracts lanceolate, much shorter than the spikes: spikes linear, 20–30-flowered, rhachis slender, flexuous; floral bracts broadly ovate, acute, 7 mm. long, equaling the sepals, not imbricate, glabrous, even: flowers sessile, suberect; sepals obovate, asymmetric; petals yellowish; stamens included: capsule narrowly cylindric.—Burch. in Journ. Bot. xxvi. 42 (1888). *T. Parkeri* Bak. in Journ. Bot. xxvi. 42 (1888).

Northwest District: Anabisi River, 1922, *Cruz 1357* (NY); Indefinite: *Parker* (K, phot. G).
[Trinidad, Brazil, Bolivia.]

2. **T. Jenmani** Bak. Acaulescent, 3.5 dm. high: leaves ellipsoid-bulbous at base, 12 cm. long, blade 6 mm. broad, involute-subulate: scape slender, somewhat decurved, its bracts elliptic, acute to long-caudate, remote: inflorescence distichous, laxly bipinnate, 16–18 cm. long; primary bracts like the scape-bracts, much shorter than the spikes: spikes 7 cm. long, spreading, laxly 8–10-flowered, long-stipitate, rhachis slender; floral bracts ovate-acute, shorter than the sepals: flowers sessile; sepals 5 mm. long, obovate, asymmetric: capsule narrowly cylindric.—Bak. in Journ. Bot. xxv. 345 (1887).

Essequibo: Kaietur Savanna, Potaro River, 1881, *Jenman 848* (K, J, phot. G).

Epiphytic.

3. **T. aloifolia** Hook. Stemless, 1 m. high or often less: leaves densely rosulate, 4–5 dm. long, sheaths large, ovate, forming an ellipsoid pseudo-bulb, blade narrowly triangular, 25 mm. broad, often transversely banded: scape slender, erect, glabrous, its bracts elliptic: inflorescence simple or laxly bipinnate: primary bracts lanceolate, small: spikes lax, rhachis slender, flexuous, strongly flattened opposite the flowers; floral bracts elliptic-acute, nerved, shorter than the sepals: flowers remote, spreading, short-stipitate, 45–55 mm. long, white, rose or purple; sepals free, obtuse, 22 mm. long; stamens and style exserted: capsule slenderly cylindric, 5–9 cm. long.—Exot. Fl. t. 205 (1827). *T. flexuosa* Lindl. in Bot. Reg. t. 749 (1823), not Sw.

Demerara: Hooroobea and Lama, 1887, *Jenman 3827* (J); Essequibo: vicinity of Bartica, on the Essequibo River, lat. 6° 25′ N., 1922, *Cruz 2026* (G, NY); Indefinite: 1894, *Jenman 6761* (NY).
[Florida, the Antilles, Central America, Colombia, Venezuela, Dutch Guiana.]

Epiphytic.

4. **T. bulbosa** Hook. Stemless, 3 dm. high or usually much less: leaves inflated, bulbous-rosulate at base, blade involute-subulate: scape erect, its bracts elliptic with long blades exceeding the inflorescence: inflorescence simple or digitate from a few spikes: spikes lanceolate, densely 5–8-flowered, compressed, 5 cm. long; floral bracts ovate-acute, 15 mm. long, exceeding the sepals, densely and finely appressed-lepidote, coriaceous: flowers erect, 3 cm. long, sessile; sepals glabrous, joined posteriorly; petals violet; stamens and style exserted: capsule cylindric, 4 cm. long.—Exot. Fl. t. 173 (1827).

NORTHWEST DISTRICT: Amakura River, lat. 8° 10′ N., long. 60° W., 1923, *Cruz 3571* (NY); POMEROON DISTRICT: Pasanalley Island, 1921, *Cruz 1085* (NY); DEMERARA: Malali, Demerara River, lat. about 5° 35′ N., 1922, *Cruz 2741* (G, NY); Demerara River, *Jenman 6245* (J, NY); ESSEQUIBO: vicinity of Bartica, on the Essequibo River, lat. 6° 25′ N., 1922, *Cruz 2027* (NY); upper Mazaruni River, long. about 60° 10′ W., 1922, *Cruz 2033, 2181, 2297, 2398* (G, NY); Kamakusa, upper Mazaruni River, long. about 59° 50′ W., 1922, *Cruz 2806* (G, NY); Tumatumari, Potaro River, 1921, *Gleason 404* (NY); INDEFINITE: *Appun* (fide Mez); *Jenman 2495* (fide Mez).

[Mexico and the Antilles to Colombia and eastern Brazil.]

Epiphytic, general throughout the colony.

5. **T. Turneri** Bak. Stemless, 4 dm. high: leaves densely rosulate, erect, 3–4 dm. long, densely and finely appressed-white-lepidote, sheath large, ovate, blade narrowly triangular, 3–4 cm. broad: scape stout, about equaling the leaves, its bracts densely imbricate: inflorescence densely bipinnate, 12 cm. long, 5 cm. broad; primary bracts broadly elliptic with a narrowly triangular blade above, nearly or quite as long as the axillary spikes: spikes 5-flowered, lanceolate, erect, 5 cm. long, 15 mm. broad, conpressed; floral bracts erect, glabrous, keeled, 18 mm. long, exceeding the sepals: flowers 23 mm. long, subsessile; posterior sepals much fused; petals erect, violet; stamens and style included.—Bak. in Journ. Bot. xxvi. 143 (1888). *T. rhodocincta* Bak. in Journ. Bot. xxvi. 143 (1888). *T. multifolia* Mez in Fedde Rep. Spec. Nov. xii. 420 (1913).

ESSEQUIBO: Humirida Mountains, *Appun 1416* (fide Mez); Mt. Roraima, *im Thurn 316* (fide Mez); 1898, *McConnell & Quelch 671* (J, phot. G); alt. 2100 m., 1910, *Ule 8558* (Berlin, K, phot. G).

[Venezuela, Colombia.]

Epiphytic.

6. **T. complanata** Benth. Stemless: leaves rosulate, minutely appressed-lepidote, often exceeding the inflorescences, 3–4 dm. long, 4–5 cm. broad above the broadly ovate sheath, often purple-tinged, ligulate, apex rounded-apiculate, scapes several to many from a single leaf-rosette, slender, each bearing a single spike; scape-bracts narrowly

elliptic, acute or apiculate, exceeding the internodes: spikes slender, 6–24-flowered, 4–8 cm. long, 15 mm. broad; floral bracts imbricate, elliptic, obtuse, not at all keeled, 15 mm. long, exceeding the sepals: flowers sessile, 22 mm. long; sepals much joined posteriorly, glabrous, nerved; petals blue or violet; stamens and style included: capsule cylindric, 4 cm. long.—Bot. Sulph. 173 (1844).

Essequibo: Mt. Roraima, alt. 2100 m., 1910, *Ule 8560* (Berlin, K, phot. G). [Antilles, Colombia, Venezuela, Ecuador, Peru, Bolivia.]

Epiphytic.

7. **T. monadelpha** (Morr.) Bak. Stemless, 35 cm. high: leaves densely rosulate, 2 dm. long, obscurely punctate-lepidote, sheath ovate blade very narrowly triangular, 10–15 mm. broad: scape erect, slender, glabrous, its bracts elliptic-lanceolate, lepidote at apex, imbricate: inflorescence simple, distichous, oblong-linear, laxly 22-flowered, 13 cm. long; rhachis straight, angled, thickened at base of each flower; floral bracts ovate-acute, spreading, 17 mm. long, equaling the sepals, keeled, nerved: flowers sessile, 30 mm. long; sepals equally short-connate, glabrous, keeled; petals white, blade ovate, reflexed; stamens deeply included, exceeding the style, filaments connate: capsule narrowly cylindric, 4–7 cm. long.—Bak. in Journ. Bot. xxv. 281 (1887). *Phytarrhiza monadelpha* Morr. in Belg. Hort. xxxii. 168, t. 7 (1882).

Northwest District: Short Cut Waini River, 1906, *Becket 8521* (J, NY); Mt. Everard, 1922, *Cruz 1301* (NY); Amakura River, lat. 8° 10′ N., long. 60° W., 1923, *Cruz 3562* (G, NY); Yarikita Police Station, junction of Yarikita and Amakura Rivers, 1920, *Hitchcock 17636* (G); Rupununi District: upper Rupununi River, near Dadanawa, lat. 2° 45′ N., 1922, *Cruz 1539* (NY); Indefinite: *Parker* (fide Mez).
[French and Dutch Guiana, Central America, Colombia, Ecuador.]

Epiphytic, general throughout the colony.

8. **T. rhododactyla** Mez. Over 1 m. high: leaves 6 dm. long, blade lingulate, 7 cm. wide, flat, rounded-apiculate, subglabrous: scape erect, stout, its bracts elliptic, acute, imbricate: inflorescence laxly bipinnate; primary bracts lanceolate, much shorter than the spikes: spikes linear, 25 cm. long, 2–3 cm. broad, compressed; floral bracts lanceolate, 25 mm. long, equaling the sepals, keeled, glabrous, even, imbricate: flowers sessile, erect; sepals free, narrowly elliptic, coriaceous: capsule short, equaling the sepals.—Mez in Fedde, Rep. Spec. Nov. xvi. 76 (1919).

Northwest District: Barima River, 1896, *Jenman 7071* (J, phot. G); Rupununi District: upper Rupununi River, near Dadanawa, lat. 2° 45′ N., 1922, *Cruz 1709* (G, NY).
[Peru.]

9. **T. stricta** Soland. Stemless or short-stemmed, 2 dm. or less high: leaves densely rosulate, 14 cm. long, the outer ones strongly recurved, sheath small, membranaceous, blade narrowly triangular, 8 mm. broad, densely appressed-lepidote: scape slender, glabrous, its bracts ovate, long-caudate, membranaceous, imbricate: inflorescence simple, polystichous, short-cylindric, 35 mm. wide; floral bracts broadly ovate, exceeding the sepals, glabrous, inflated, nerved, roseate, the lower ones long-caudate: flowers suberect, 2 cm. long, sessile; sepals lance-oblong, compressed, keeled, nerved, equally short-connate; petals blue changing to red, exceeding the pistil; stamens shorter than the pistil: capsule cylindric, 38 mm. long.—Soland. in Bot. Mag. t. 1529 (1813).

DEMERARA: Hooroobea, 1887, *Jenman 3825* (J, phot. G).
[Dutch Guiana, Brazil.]

Epiphytic.

10. **T. recurvata** L. Short-caulescent, 2 dm. or less high, often densely massed: leaves distichous, sheath ovate, blade linear, subterete, 1 mm. broad, recurving, gray, densely tomentose-lepidote, obtuse: scape slender, erect, terminal, lepidote, naked or with a single long-caudate bract: inflorescence a single 1–5-flowered distichous spike; rhachis angled, lepidote; bracts lanceolate, 12 mm. long, exceeding the sepals, ecarinate, lepidote: flowers 14 mm. long, erect; sepals slightly and equally connate at base, lanceolate; petals pale violet, blade narrow; stamens deeply included, exceeding the style: capsule narrowly cylindric.—Sp. Pl. ed. 2. 410 (1762).

[Southern United States to northern Argentina and Chile.]

Reported by Schomburgk and undoubtedly present although no specimens seen.

11. **T. usneoides** L. Long-filiform-caulescent, flexuous, often densely massed, gray, densely tomentose-lepidote throughout: leaves distichous, sheath elliptic, blade linear, less than 1 mm. broad, recurving: flowers solitary, soon becoming axillary by the elongation of the stem, short-pedicelled, yellowish green or blue, 10–12 mm. long; sepals narrowly ovate, equally connate at base, 7 mm. long; petals small, blade narrow, recurved; stamens deeply included, exceeding the style: capsule narrowly cylindric, abruptly short-beaked.—Sp. Pl. ed. 2. 411 (1762).

BERBICE: Canje Creek, Aug. 1908, *Bartlett* (J); INDEFINITE: *Schomburgk 159* (fide Mez).
[Southern United States to central Argentina and Chile.]

Epiphytic.

16. **GUZMANIA** R. & P.

Leaves densely rosulate, entire sheaths conspicuous. Inflorescence various, spikes always polystichous. Flowers perfect. Sepals usually somewhat connate. Petals connate or closely conglutinated, naked, yellow or white. Stamens usually included, filaments more or less fused to the petals. Ovary wholly superior, pyramidal, ellipsoid, or ovoid, glabrous. Ovules many, densely glomerate. Capsule septicidal. Seeds with a long usually brownish coma.—Fl. Peruv. iii. 37, t. 261 (1802).

About 80 species. Chiefly Andean with outlying species in southern Central America, the West Indies, Venezuela, Guiana, and the Amazon Basin.

Key to Species.

1. Inflorescence simple.
   2. Inflorescence short, corymbiform.....1. *G. lingulata.*
   2. Inflorescence cylindric, bracts membranous.
      3. Inflorescence sterile at apex with rudimentary flowers in the axils of the bracts. Antilles, Trinidad, Venezuela. (*G. monostachya*).
      3. Inflorescence fertile throughout, few-flowered. French Guiana.....(*G. Melinonis*).
1. Inflorescence compound.
   4. Floral bracts equaling or exceeding the sepals: spikes densely flowered.
      5. Spikes short, exceeded by the primary bracts.....2. *G. capituligera.*
      5. Spikes elongate, much exceeding the primary bracts..3. *G. Altsonii.*
   4. Floral bracts shorter than the sepals: spikes laxly flowered..4. *G. Roezli.*

1. **G. lingulata** (L.) Mez. Stemless, 3 dm. high: leaves 3–4 dm. long, obscurely punctulate-lepidote, blade lingulate, acute, 3–4 cm. wide: scape stout, erect, often short, its bracts leaf-like, densely imbricate: inflorescence short, corymbiform, 7 cm. broad; outer bracts lanceolate, forming an involucre which wholly conceals the flowers, red-tinged; floral bracts shorter than the flowers, linear, cucullate: flowers erect, short-pedicelled, 45 mm. long; sepals free, 17 mm. long, narrowly linear, rounded, glabrous; petals linear, cucullate, white; ovary ellipsoid: capsule subellipsoid, 3 cm. long, short-beaked; coma reddish brown.—Mez in DC. Mon. Phan. ix. 899 (1896). *Tillandsia lingulata* L. Sp. Pl. 286 (1753).

Northwest District: Amakura River, lat. 8° 10′ N., long. 60° W., 1923, *Cruz 3561* (G, NY); Essequibo: Chinabourie Creek, Potaro River, 1907, *Bartlett 8750* (J); vicinity of Bartica, on the Essequibo River, lat. 6° 25′ N., 1922, *Cruz 1877* (G, NY); Kamakusa, upper Mazaruni River, 1922, *Leng 347* (NY); Rupununi District: upper Rupununi River, near Dadanawa, lat. 2° 45′ N., 1922, *Cruz 1514* (NY), *1695* (G, NY); Indefinite: *Appun 835* (K).

[Central America, Antilles, Colombia, Venezuela, French and Dutch Guiana.]

Epiphytic, general throughout the colony.

2. **G. capituligera** (Griseb.) Mez. Stemless, 1 m. or more high: leaves 8 dm. long, obscurely punctate-lepidote, blade lingulate, acute, 6 cm. broad: scape stout, erect, shorter than the leaves, its bracts leaf-like, densely imbricate: inflorescence narrowly cylindric, bipinnate, 5 dm. long; primary bracts like the scape-bracts, broad, exceeding the axillary spikes: spikes densely few-flowered, suberect or spreading; floral bracts ovate, rounded-mucronate, incurved, 3 cm. long, exceeding the sepals, chartaceous, prominently nerved: sepals elliptic, coriaceous, even, glabrous: capsule ellipsoid; coma whitish.—Mez in DC. Mon. Phan. ix. 926 (1896). *Tillandsia capituligera* Griseb. Cat. Cub. 254 (1866).

NORTHWEST DISTRICT: Yarikita Police Station, junction of Yarikita and Amakura Rivers, 1920, *Hitchcock 17633* (G).

[Antilles.]

Epiphytic.

3. **G. Altsonii** L. B. Smith. Stemless, 1 m. or more high: leaves 5 dm. long, blade lingulate, acute, 4 cm. wide: scape stout, erect, its bracts leaf-like: inflorescence laxly bipinnate, 6 dm. long, nearly 2 dm. wide; primary bracts ovate, acuminate, much shorter than the axillary spikes: spikes densely flowered, narrowly ellipsoid, 6 cm. long, 2 cm. broad, with a thick stipe, 1–4 cm. long, bearing several sterile bracts; floral bracts broadly elliptic, 2 cm. long, about equaling the sepals, obscurely punctate, prominently nerved at apex, densely imbricate: flowers 3 cm. long, erect, white; sepals narrowly elliptic, keeled.—L. B. Smith, see page 7.

ESSEQUIBO: Kaietur Plateau, Potaro River, 1926, *Altson 551* (K, phot. G).

Epiphytic.

4. **G. Roezli** (Morr.) Mez. Stemless, nearly 1 m. high: leaves 4 dm. long, glabrous, blade lingulate, rounded-apiculate, 38 mm. wide: scape erect, exceeding the leaves, its bracts narrowly ovate, acute, the upper ones shorter than the internodes: inflorescence laxly bipinnate, branches spreading, with long sterile bases: spikes laxly many-flowered, cylindric; primary bracts ovate-acute, much shorter than the spikes; floral bracts 17 mm. long, shorter than the sepals, narrowly ovate, not keeled, glabrous: flowers 23 mm. long, sessile, suberect; sepals elliptic; petals white, spreading: coma reddish brown.—Mez in DC. Mon. Phan. ix. 948 (1896), as *Roezlii*. *Schlumbergeria Roezli* Morr. in Belg. Hort. xxviii. 311 (1878). *Tillandsia rigidula* Bak. in Journ. Bot. xxvi. 44 (1888).

NORTHWEST DISTRICT: Yarikita Police Station, junction of Yarikita and Amakura Rivers, 1920, *Hitchcock 17632* (G, NY); ESSEQUIBO: Mazaruni River, 1896, *Jenman 6162* (J, phot. G); INDEFINITE: *Appun* (fide Mez).

[Colombia.]

Epiphytic.

SUPPLEMENT:
SPECIES DESCRIBED FROM CULTIVATION
AND
DOUBTFULLY ASSIGNED TO GUIANA.

Cryptanthus Lacerdae Ant. Plant 15 cm. broad, 5 cm. high: leaves few, constricted above the ovate base, 8 cm. long, 3 cm. wide, subovate, densely serrate, acute-apiculate, the margin scarcely or not at all undulate, the upper surface coarsely lepidote except for two broad glabrous spots extending longitudinally, the lower surface evenly white-lepidote: inflorescence very few-flowered; floral bracts membranaceous, narrowly triangular, spinulose-serrate, tomentose, equaling the sepals: sepals 13 mm. long, narrowly triangular above, spinulose-pointed, symmetric, sparsely lepidote; ovary narrowly cylindric.—Ant. in Wien. Illustr. Gartenz. 254 (1882).

Aregelia Morreniana (Ant.) Mez. Leaves densely rosulate, violet at base, remotely spinulose-serrate, densely gray-lepidote throughout, narrowly linear, 5 dm. long: inflorescence many-flowered: bracts linear-lanceolate, rounded, laciniate-serrulate, sparsely lepidote, about equaling the sepals: flowers 40 mm. long, long-stipitate; sepals connate at base for 4 mm., lobes rounded or abruptly acute, nearly symmetric, glabrous; petals high-connate, acuminate, dark violet at apex, margins and base white; ovary ellipsoid, obtusely trigonous, 10 mm. long, 4 mm. thick; ovules borne near the apex of the cell.—Mez in DC. Mon. Phan. ix. 72 (1896). *Karatas Morreniana* Ant. Phyto-Icon. t. 35 (1884).

Hohenbergia ferruginea Carr. Leaves 1 m. long, 75 mm. wide, serrulate: scape stout; scape-bracts long-acuminate, entire: inflorescence bipinnate, about equaling the leaves, axes white-tomentose; primary bracts spreading, the lower ones about equaling the axillary spikes: spikes ellipsoid, many-flowered, tomentose or glabrate; floral bracts strongly convex, long-acuminate: flowers 17 mm. long; sepals pungent, coriaceous, free, 4–5 mm. long, ecarinate; petals white, 12 mm. long, united below, acute; ovary more or less white-farinose, 3-winged, obovoid; ovules obtuse, borne at the apex of the placenta.—Carr. in Rev. Hort. 437, fig. 104 (1881).

Aechmea fulgens Brongn. Leaves densely rosulate, 4 dm. long, 65 mm. wide, subensiform, minutely serrulate, rounded-apiculate: scape erect, glabrous, its bracts lanceolate, entire, roseate: inflorescence compound at base, simple for the upper half, about equaling the leaves, glabrous, red: spikes loosely 3–8-flowered, polystichous; floral bracts none: sepals 5 mm. long, rounded-emarginate, asymmetric,

violet; petals 12 mm. long, erect, rounded, ligulate at base, violet changing to red; ovary ellipsoid, 7 mm. thick, epigynous tube conspicuous; ovules long-caudate, borne high in the ovary: berry scarcely enlarged from the ovary.—Brongn. in Ann. Sc. Nat. ser. 2, xv. 371 (1841), as *Aechmaea.*

Quesnelia Skinneri Morr. Leaves 6 dm. long, 4 cm. wide above the ovate base, pungent, densely and coarsely serrate, mottled: scape stout, erect, arachnoid, its bracts broadly ovate, rounded-mucronate: inflorescence many-flowered, densely ellipsoid or globose, 10 cm. long, 7.5 cm. thick; floral bracts broadly ovate, entire, membranaceous, rose with a narrow white undulate-crisped margin, 45 mm. long, much exceeding the flowers: flowers 4 cm. long: sepals free, obovate, 16 mm. long; petals violet, 32 mm. long, epigynous tube conspicuous.—Morr., in Belg. Hort. xxxi. 82 (1881), nomen. Bak. Brom. 84 (1889), nomen. Mez in DC. Mon. Phan. ix. 290 (1896).

Quesnelia Lamarckii Bak. Imperfectly known: inflorescence densely short-cylindric, 3 dm. long, 1 dm. broad, many-flowered; bracts oblong, obtuse, 5–7.5 cm. long: sepals free, linear-oblong, obtuse, 18–25 mm. long: berry trigonous-clavate, 25–31 mm. long. Brom. 85 (1889).

Quesnelia roseo-marginata (C. Koch) Carr. Leaves 60 cm. long, 4.5 cm. wide, linear, abruptly acute, pungent, mottled: scape short, stout, its bracts densely imbricate: inflorescence densely ellipsoid, truncate, 7 cm. long, 4.5 cm. thick; floral bracts obovate, 26 mm. long, entire, membranaceous, not crisped, arachnoid toward base: flowers 36 mm. long; sepals free, obtuse, 10 mm. long, densely arachnoid; petals at least twice as long as the sepals, scales incised; ovary cylindric, arachnoid, epigynous tube conspicuous.—Carr. in Rev. Hort. 70, fig. 14 (1880). *Billbergia roseo-marginata* C. Koch in Wochenschr. 141 (1867).

Pitcairnia Altensteinii (F. Kl.) Lem. Leaves all alike, definitely petioled, entire, blade lanceolate, 50 cm. long, 5 cm. broad: scape erect, its bracts lance-acuminate, red with green tips, densely imbricate: inflorescence a simple densely flowered spike; floral bracts ovate, abruptly acute, exceeding the sepals: flowers erect, 7 cm. long, pedicel stout, 2 mm. long; sepals 18 mm. long, sublinear, rounded; petals 67 mm. long, white, acute, with rudimentary scale at base; ovary $\frac{4}{5}$ superior, ovules long-caudate.—Lem. in Fl. Serres, ii. t. 162 (1846), as *Altensteini.* *Puya Altensteinii* Lk., Kl., & Otto, Ic. Pl. Rar. Berol. i. 1, t. 1 (1841).

LIST OF NUMBERED EXSICCATAE CITED

Abraham, A. A. British Guiana.
250 Pitcairnia Kegeliana

Altson. British Guiana.
160 Ananas sativus
161 Ananas sativus
338 Navia Gleasonii
377 Vriesia longibracteata
498 Vriesia longibracteata
551 Guzmania Altsonii

André, E. F. Colombia, Ecuador.
2214 in part Tillandsia tetrantha v. aurantiaca
2319 Tillandsia ropalocarpa
2342 Tillandsia tetrantha v. densiflora.
2414 Tillandsia tenuispica
2496 Tillandsia subalata
3032 Tillandsia pectinata
3138 Tillandsia tetrantha v. miniata
3138 bis Tillandsia tetrantha v. scarlatina
3763 in part Tillandsia homostachya
3763 in part Tillandsia subalata
3792 Tillandsia adpressa
3795 Tillandsia inconspicua
4055 Tillandsia multiflora v. decipiens
4408 Tillandsia Riocreuxii
4502 Tillandsia Seemanni v. Mezii

Appun, C. F. British Guiana.
249 Aechmea humilis
250 Aechmea muconiflora
835 Guzmania lingulata
1055 Navia angustifolia
1416 Tillandsia Turneri
1582 Pitcairnia nuda

Bang, M. Bolivia.
2301 in part Tillandsia triticea

Barclay. Ecuador.
524 Tillandsia multiflora v. decipiens

Bartlett, A. W. British Guiana.
8397 Aechmea humilis
8742 Aechmea Mertensii
8750 Guzmania lingulata

Baur, G. Galapagos Islands.
237 Tillandsia insularis

Beckett, J. E. British Guiana.
8521 Tillandsia monadelpha

Biolley f., P. Costa Rica.
17362 Tillandsia adpressa v. Tonduziana
17363 Tillandsia spiculosa v. palmana
17369 Tillandsia chontalensis

Botteri. Mexico.
1005 Tillandsia Ghiesbreghtii
1006 Tillandsia Ghiesbreghtii

Britton, E. G. and aids. Trinidad.
1323 in part Tillandsia micrantha
1323 in part Tillandsia triticea

Broadway, W. E. Trinidad.
9912 Tillandsia micrantha

Buchtien, O. Bolivia.
1266 Tillandsia monticola

Burchell, W. J. Brazil.
3217 Tillandsia triticea

Cruz, J. S. De La. British Guiana.
1085 Tillandsia bulbosa
1301 Tillandsia monadelpha
1308 Araeococcus micranthus
1357 Tillandsia triticea
1467 Aechmea humilis
1514 Guzmania lingulata
1539 Tillandsia monadelpha
1695 Guzmania lingulata
1709 Tillandsia rhododactyla
1877 Guzmania lingulata
2026 Tillandsia aloifolia
2027 Tillandsia bulbosa
2033 Tillandsia bulbosa
2181 Tillandsia bulbosa
2297 Tillandsia bulbosa
2398 Tillandsia bulbosa
2741 Tillandsia bulbosa
2744 Pitcairnia Kegeliana
2806 Tillandsia bulbosa
2830 Pitcairnia Kegeliana
2997 Pitcairnia Kegeliana
3199 Araeococcus micranthus
3281 Aechmea Mertensii
3561 Guzmania lingulata
3562 Tillandsia monadelpha
3571 Tillandsia bulbosa
3717 Aechmea humilis
4145 Araeococcus micranthus
4457 Pitcairnia Kegeliana

Cuming. Ecuador.
1269 Tillandsia multiflora

Curran, H. M. Brazil.
137 Tillandsia triticea

Drake. Ecuador.
152 Tillandsia tripinnata
306 Tillandsia crispa

Dusén, P. Brazil.
17070 Tillandsia triticea

Edwall, G., in herb. Inst. Biol. São Paulo. Brazil.
12398 Tillandsia triticea

Eggers, H. Ecuador.
15040 Tillandsia multiflora
15252 Tillandsia monadelpha

Fendler, A. Trinidad, Venezuela.
818 Tillandsia micrantha
1511 Tillandsia spiculosa
1523 Tillandsia Fendleri

Frarão, A., in herb. Mus. Nac. Rio de Janeiro. Brazil.
11523 Tillandsia aerisincola

Gleason, H. A. British Guiana.
73 Aechmea Mertensii
404 Tillandsia bulbosa
585 Aechmea humilis
747 Aechmea Mertensii

Goll, G. P. Guatemala.
117 Tillandsia monadelpha

Graham, E. H. British Guiana.
121 Aechmea humilis

Harris, in herb. Bot. Dept. Jamaica.
5186 Tillandsia Fawcettii

Herb. Inst. Phys.-Geogr. Costaric. Costa Rica.
11376 Tillandsia contorta

Hioram, B. Cuba.
4135 Tillandsia Lescaillei

Hitchcock, A. S. British Guiana, Ecuador.
16893 in part Aechmea Mertensii
16893 in part Aechmea mucroniflora
17130 Aechmea Mertensii
17288 Aechmea tillandsioides
17631 Wittmackia odora
17632 Guzmania Roezli
17633 Guzmania capituligera
17636 Tillandsia monadelpha
20633 Tillandsia rectiflora
21106 Tillandsia multiflora v. decipiens
21244 Tillandsia multiflora v. decipiens
21323 Tillandsia Hitchcockiana
21357 Tillandsia multiflora v. tomensis
21358 Tillandsia sinuosa
21383 Tillandsia tetrantha v. scarlatina
21424 Tillandsia tetrantha v. aurantiaca
21571 Tillandsia tetrantha v. scarlatina
21586 Tillandsia pugiformis

im Thurn, E. F. British Guiana.
45 Puya floccosa
315 Puya Quelchii
316 Tillandsia Turneri

Jenman, G. S. British Guiana.
31 Ananas sativus
611 Aechmea nudicaulis
848 Tillandsia Jenmani
853 Aechmea Mertensii
873 Brocchinia reducta
903 Aechmea Melinonii
957 Gravisia brassicoides
971 Catopsis Berteroniana
1196 Brocchinia micrantha
2041 Pitcairnia incarnata
2044 Vriesia pachychlamys
2107 Aechmea nudicaulis
2495 Tillandsia bulbosa
2501 Araeococcus micranthus
3814 Aechmea Mertensii
3825 Tillandsia stricta
3826 Gravisia aquilega
3827 Tillandsia aloifolia
3828 Vriesia procera
4009 Aechmea Melinonii
4039 Aechmea Melinonii
4056 Aechmea bromeliaefolia
4105 Bromelia Karatas
4116 Aechmea tillandsioides
4153 Aechmea bromeliaefolia
4839 Aechmea nudicaulis
5120 Aechmea humilis
6162 Guzmania Roezli
6244 Catopsis sessiliflora
6245 Tillandsia bulbosa
6761 Tillandsia aloifolia
6896 Aechmea tillandsioides
6913 Aechmea tillandsioides
7071 Tillandsia rhododactyla
7363 Ananas sativus
7592 Ananas sativus
7595 Ananas sativus

Johnston, J. R. Venezuela.
313 Tillandsia micrantha

Killip, E. P., and aids. Colombia.
5587 Tillandsia adpressa v. Tonduziana
5843 Tillandsia ropalocarpa
9457 Tillandsia tetrantha v. miniata
11532 Tillandsia monadelpha
14530 Tillandsia subimbricata
15067 Tillandsia membranacifolia
15843 Tillandsia tetrantha v. aurantiaca
17207 Tillandsia tetrantha v. aurantiaca
18269 Tillandsia tetrantha v. aurantiaca
19197 Tillandsia adpressa v. Tonduziana
19959 Tillandsia tetrantha v. aurantiaca
20106 Tillandsia adpressa v. Tonduziana
20523 Tillandsia tenuispica

Kuntze, O. Costa Rica.
2009 Tillandsia monadelpha

Langlassé, E. Mexico, Colombia.
30 Tillandsia cylindrica
31 Tillandsia cylindrica
94 Tillandsia Michelii

Lehmann, F. C. Colombia.
XXI Tillandsia tetrantha v. aurantiaca
XXII Tillandsia adpressa v. Tonduziana
XXIII Tillandsia crispa
4921 Tillandsia crispa

Leng, H. British Guiana.
222 Aechmea Mertensii
229 Aechmea Mertensii
317 Pitcairnia Kegeliana
345 Aechmea nudicaulis
347 Guzmania lingulata
348 Aechmea Mertensii
385 Aechmea bromeliaefolia
389 Araeococcus micranthus

Linder, D. H. British Guiana.
35 Aechmea humilis

Macbride, J. F., and aids. Peru.
2258 Tillandsia Macbrideana
2278 Tillandsia flexuosa
3768 Tillandsia tetrantha
4216 Tillandsia parviflora
4265 Tillandsia rhododactyla
5757 Tillandsia Weberbaueri
5784 Tillandsia pendulispica

Mandon, G. Bolivia.
1172 Tillandsia flexuosa

McConnell & Quelch. British Guiana.
107 Puya Quelchii
670 Puya Augustae
671 Tillandsia Turneri
672 Puya Quelchii
701 Puya floccosa
702 Brocchinia reducta

Nash & Taylor. Hayti.
1094 Tillandsia Lescaillei
1757 Tillandsia Fendleri

Peck, M. E. British Honduras.
834 Billbergia viridiflora

Pennell, F. W., and aids. Colombia.
5746 Tillandsia adpressa v. Tonduziana
6979 Tillandsia tetrantha v. miniata
7406 Tillandsia subalata
7564 Tillandsia subalata
9268 Tillandsia tetrantha v. aurantiaca
10514 Tillandsia tetrantha v. miniata

Pittier, H. Panama.
2658 Tillandsia monadelpha

Poeppig, E. Peru.
1348 Tillandsia pendulispica

Purpus, C. A. Mexico.
8775 Tillandsia Ghiesbreghtii

Rose, J. N. & G. Ecuador.
22579 Tillandsia rectiflora

Rothschuh. Nicaragua.
54 Tillandsia spiculosa v. Rothschuhiana

Rusby, H. H. Bolivia.
2852 Tillandsia spiculosa

Schipp, W. A. British Honduras.
390 Tillandsia monadelpha

Schomburgk, R. British Guiana.
20 Lindmania guianensis
159 Tillandsia usneoides
585 Pitcairnia Kegeliana
687 Puya Augustae
1021 Puya Augustae
1025 Aechmea bromeliaefolia
1564 Lindmania guianensis

Seemann. Ecuador.
898 Tillandsia Seemanni

Shafer, J. A. Cuba.
8057 Tillandsia Lescaillei

Smith, H. H. Colombia.
2346 Tillandsia aerisincola
2349 Tillandsia crenulipetala
2852 Tillandsia spiculosa
2857 Tillandsia crenulipetala

Smith, L. B., and aids. Brazil.
1827 Tillandsia triticea
1828 Tillandsia aerisincola
2018 Tillandsia aerisincola

Sodiro. Ecuador.
171/31 Tillandsia quadripinnata
171/33 Tillandsia monticola

Standley, P. C., and aids. Panama, Costa Rica, Honduras.
26254 Tillandsia subimbricata
26837 Tillandsia subimbricata
28255 Tillandsia subimbricata
33763 Tillandsia spiculosa v. palmana
33781 Tillandsia spiculosa v. palmana
33782 Tillandsia adpressa v. Tonduziana
33804 Tillandsia chontalensis
34180 Tillandsia adpressa v. Tonduziana
34187 Tillandsia adpressa v. Tonduziana
34188 Tillandsia adpressa v. Tonduziana
34305 Tillandsia adpressa v. Tonduziana
36827 Tillandsia monadelpha
37310 Tillandsia monadelpha
38260 Tillandsia adpressa v. Tonduziana
38261 Tillandsia adpressa v. Tonduziana
38296 Tillandsia adpressa v. Tonduziana
38334 Tillandsia adpressa v. Tonduziana
39590 Tillandsia adpressa v. Tonduziana
39910 Tillandsia spiculosa v. palmana
39918 Tillandsia spiculosa v. palmana
39930 Tillandsia spiculosa v. palmana
41169 Tillandsia monadelpha
42312 Tillandsia adpressa v. orthiantha
44783 Tillandsia monadelpha
45123 Tillandsia monadelpha
45601 Tillandsia monadelpha
45611 Tillandsia monadelpha
45626 Tillandsia monadelpha
46031 Tillandsia monadelpha
46045 Tillandsia guanacastensis
46263 Tillandsia monadelpha
46391 Tillandsia guanacastensis
47229 Tillandsia spiculosa v. palmana
47236 Tillandsia monadelpha
47663 Tillandsia adpressa v. Tonduziana
48297 Tillandsia adpressa v. Tonduziana
48946 Tillandsia monadelpha
48993 Tillandsia monadelpha
49503 Tillandsia spiculosa v. palmana
50196 Tillandsia adpressa v. Tonduziana
50755 Tillandsia adpressa v. Tonduziana
51296 Tillandsia spiculosa v. palmana
51667 Tillandsia adpressa v. Tonduziana
51781 Tillandsia chontalensis
51784 Tillandsia spiculosa v. palmana
54811 Tillandsia monadelpha

Stewart, A. Galapagos Islands.
1116 Tillandsia insularis
1117 Tillandsia insularis

Tate, G. H. H. British Guiana, Venezuela.
257 Brocchinia reducta
520 Tillandsia Fendleri
782 Tillandsia micrantha

Tate, R. Nicaragua.
413 Tillandsia chontalensis

Tonduz, A., in herb. Inst. Phys.-Geogr. Costar. Costa Rica.
12670 Tillandsia adpressa v. Tonduziana

Trinidad Bot. Gard. Trinidad.
2005 Tillandsia subimbricata

Ule, E. Brazil, British Guiana, Peru.
4957 Tillandsia aerisincola
6602 Tillandsia parviflora
6665 Tillandsia crispa
8557 Puya Quelchii

8558 Tillandsia Turneri
8560 Tillandsia complanata
8561 Brocchinia reducta

Weberbauer, A. Peru.
1231 Tillandsia Weberbaueri
1287 Tillandsia pendulispica
3298 Tillandsia pallidoflavens

Wercklé, C., in herb. Inst. Phys.-Geogr. Costar. Costa Rica.
16177 Tillandsia spiculosa v. palmana

Wright, C. Cuba.
674 Tillandsia Lescaillei

Explanation of Plates.

Plate I.

Fig. 1. Guzmania Altsonii L. B. Smith (*Altson 551*), inflorescence × ¼.
2. Navia Gleasonii L. B. Smith (*Altson 338*), habit × ¼.
3. Same, flower × 1.
4. Tillandsia pugiformis L. B. Smith (*Hitchcock 21586*), habit × 1/10.
5. Same, branch × 1.
6. Same, section of branch × 3.
7. Same, sepal × 5.

Plate II.

Fig. 1. Tillandsia Macbrideana L. B. Smith (*Macbride & Featherstone 2258*), habit × ½.
2. Same, flower × 1.
3. Same, posterior sepals × 1.
4. Tillandsia membranacifolia L. B. Smith (*Killip & Smith 15067*), habit × 1/8.
5. Same, apex of inflorescence × ½.
6. Same, apex of spike × 2.
7. Same, sepal × 5.
8. Tillandsia sinuosa L. B. Smith (*Hitchcock 21358*), habit × 1/10.
9. Same, branch × ½.
10. Same, section of branch × 2.
11. Same, petal and genitalia × 5.
12. Same, sepal × 5.

Plate III.

Fig. 1. Tillandsia cylindrica Watson (*A. Dugès*), inflorescence × ¼.
2. Same, flower × 1, showing posterior sepals.
3. Tillandsia crenulipetala Mez (*H. H. Smith 2349*), habit × ¼.
4. Same, petal and genitalia × 1.
5. Tillandsia chontalensis Bak. (*Standley & Torres 51781*), habit × ¼
6. Same, flower × 3.
7. Same, petal and genitalia × 3.

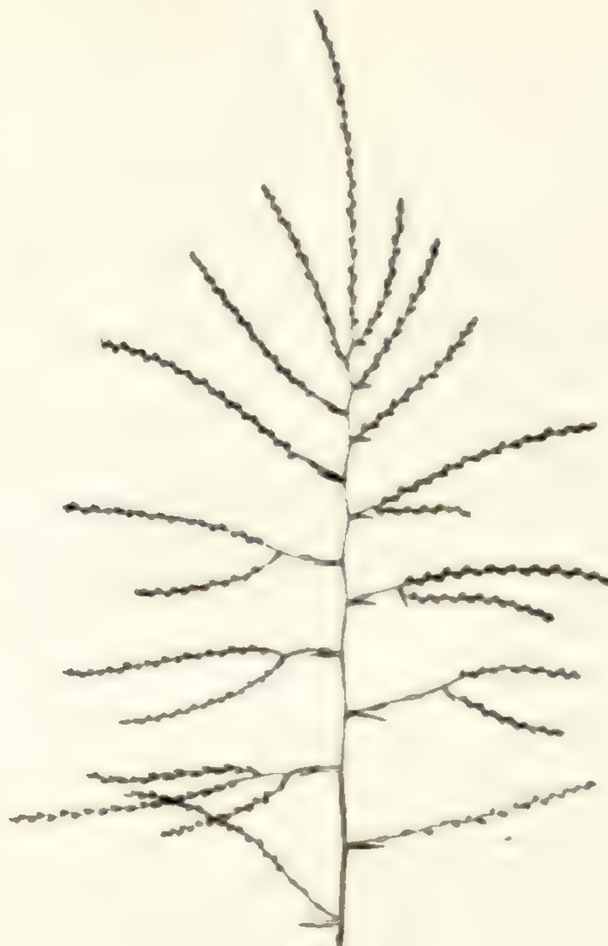
Plate IV.

Fig. 1. Tillandsia subimbricata Bak. (*Botanic Gardens, Trinidad 2005*). inflorescence × ¼.
2. Tillandsia Hitchcockiana L. B. Smith (*Hitchcock 21323*), inflorescence × ¼.
3. Same, leaf × ¼.
4. Same, scape × ¼.
5. Same, sepal (right), petal, and genitalia × 1.

Plate V.

Fig. 1. Tillandsia multiflora Benth. var. tomensis L. B. Smith (*Hitchcock 21357*), habit × 1/6.
2. Same, primary branch × 1.
3. Same, sepal × 5.
4. Same, petal and genitalia × 5.
5. Tillandsia aerisincola Mez (*H. H. Smith 2346*), primary branch × 1
6. Map, showing relative distribution of the *Bromeliaceae* as a whole and of the section *Pseudo-Catopsis* of *Tillandsia*.

7



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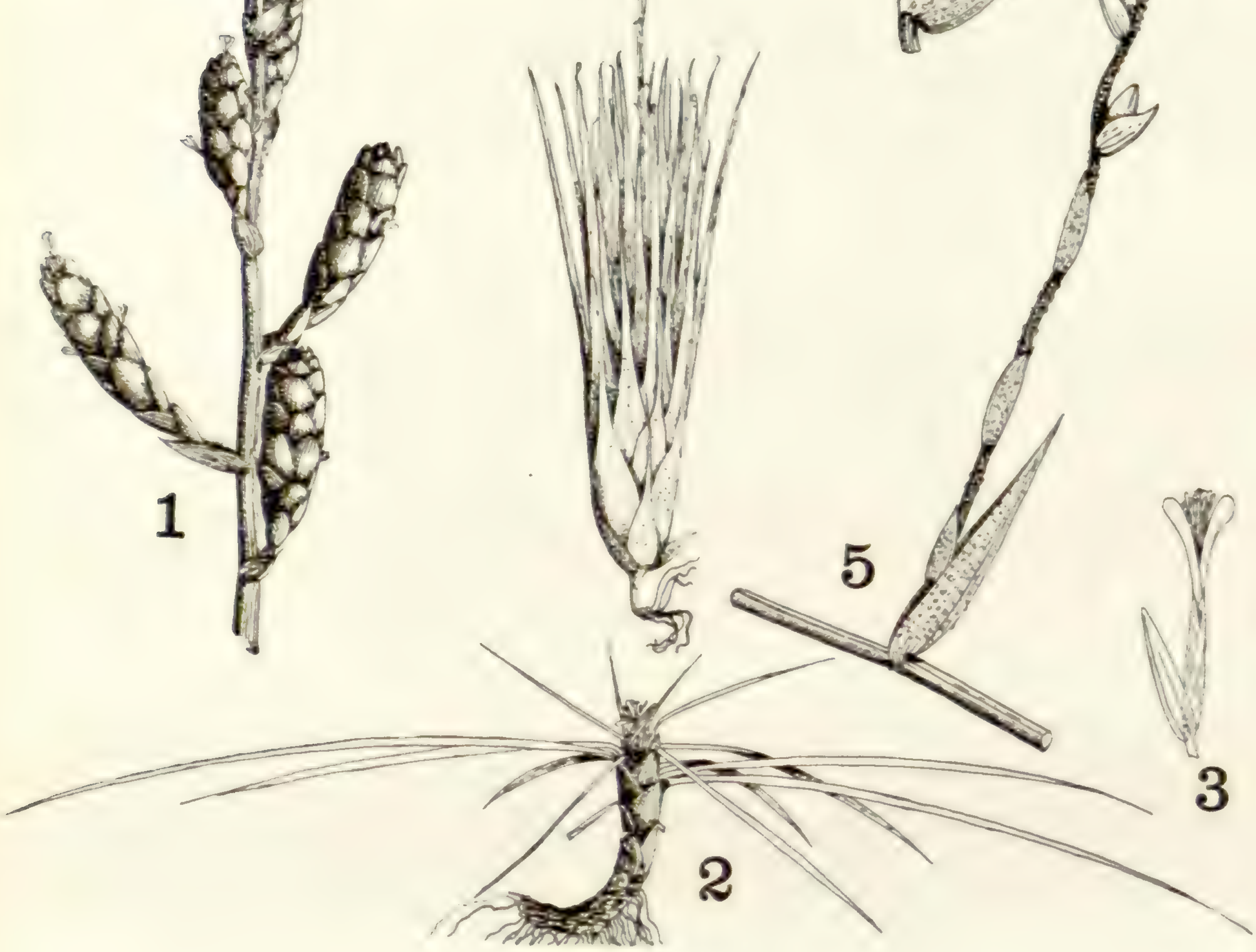
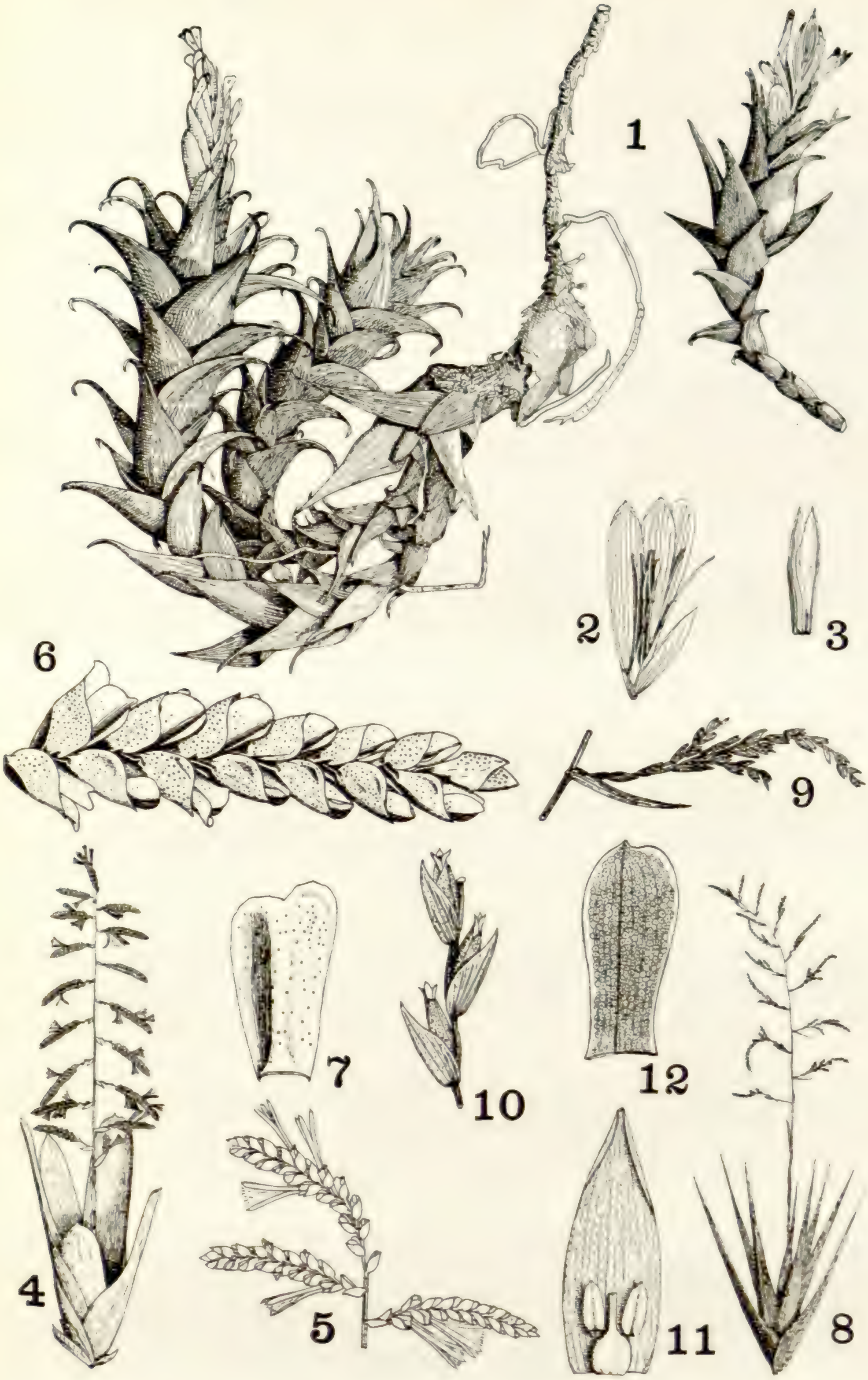


2

Fig. 1. GUZMANIA ALTSONII L. B. Sm.
Figs. 2–3. NAVIA GLEASONII L. B. Sm.
Figs. 4–7. TILLANDSIA PUGIFORMIS L. B. Sm.



Figs. 1–3. TILLANDSIA MACBRIDEANA L. B. Sm.
Figs. 4–7. T. MEMBRANACIFOLIA L. B. Sm.
Figs. 8–12. T. SINUOSA L. B. Sm.

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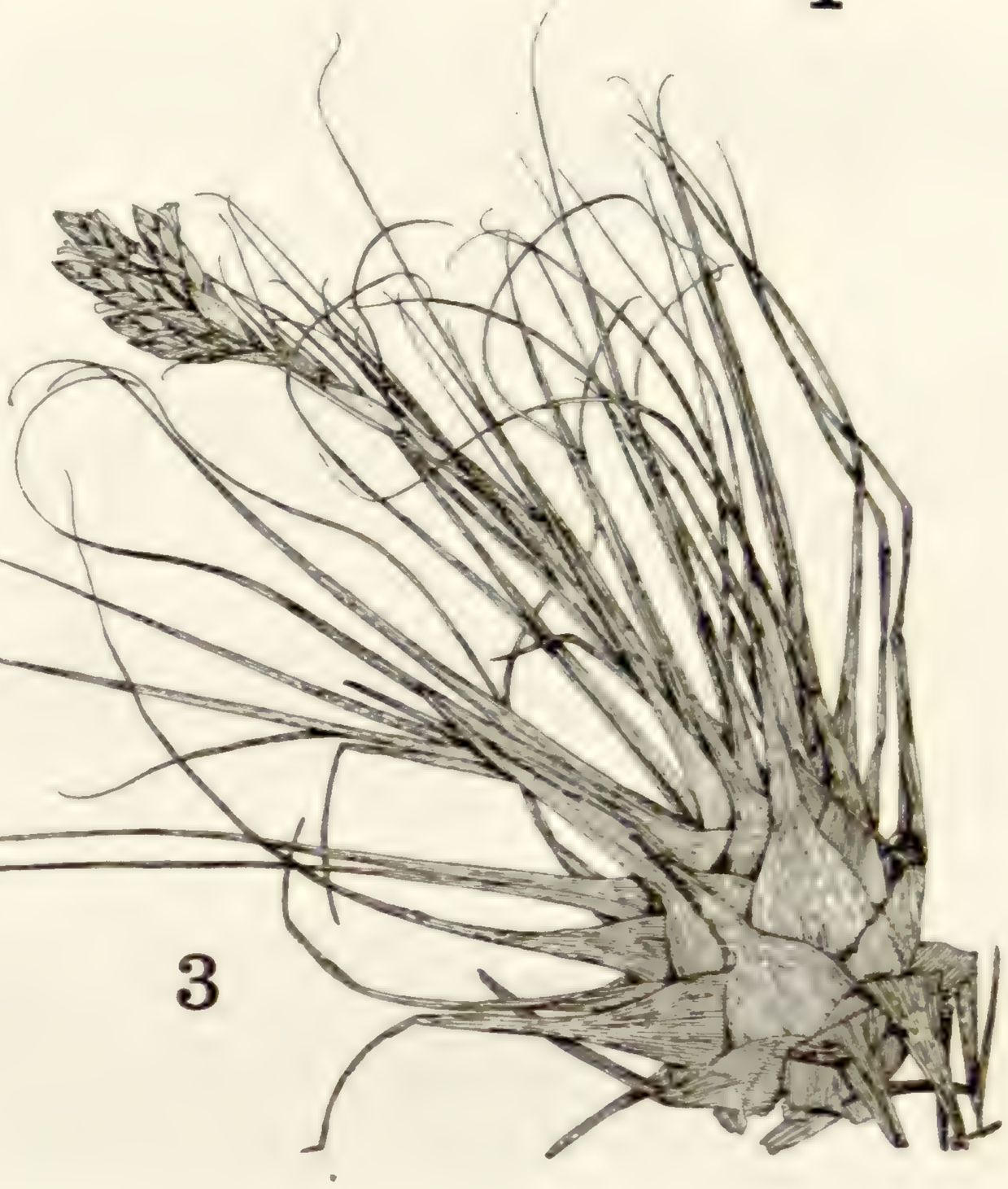
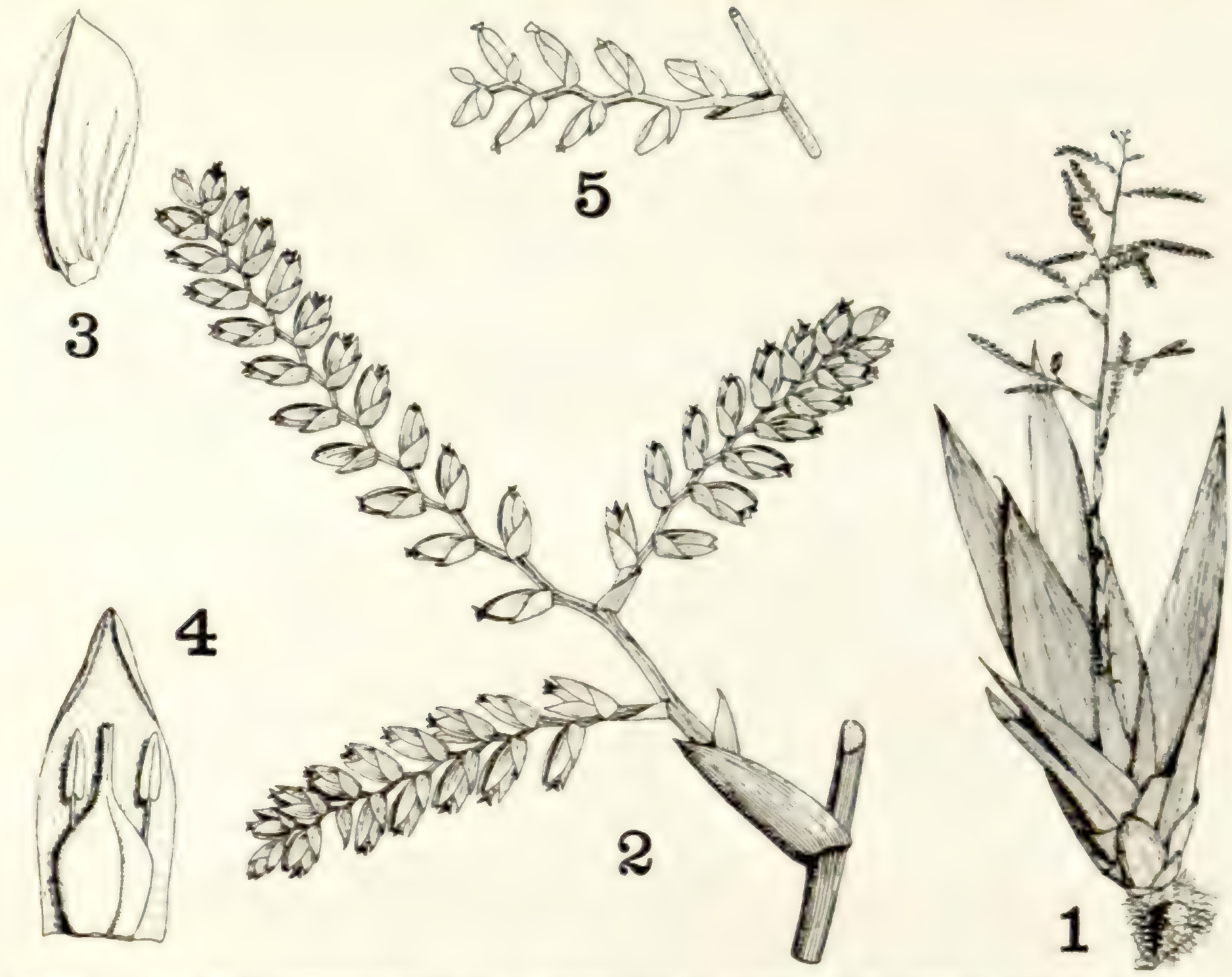
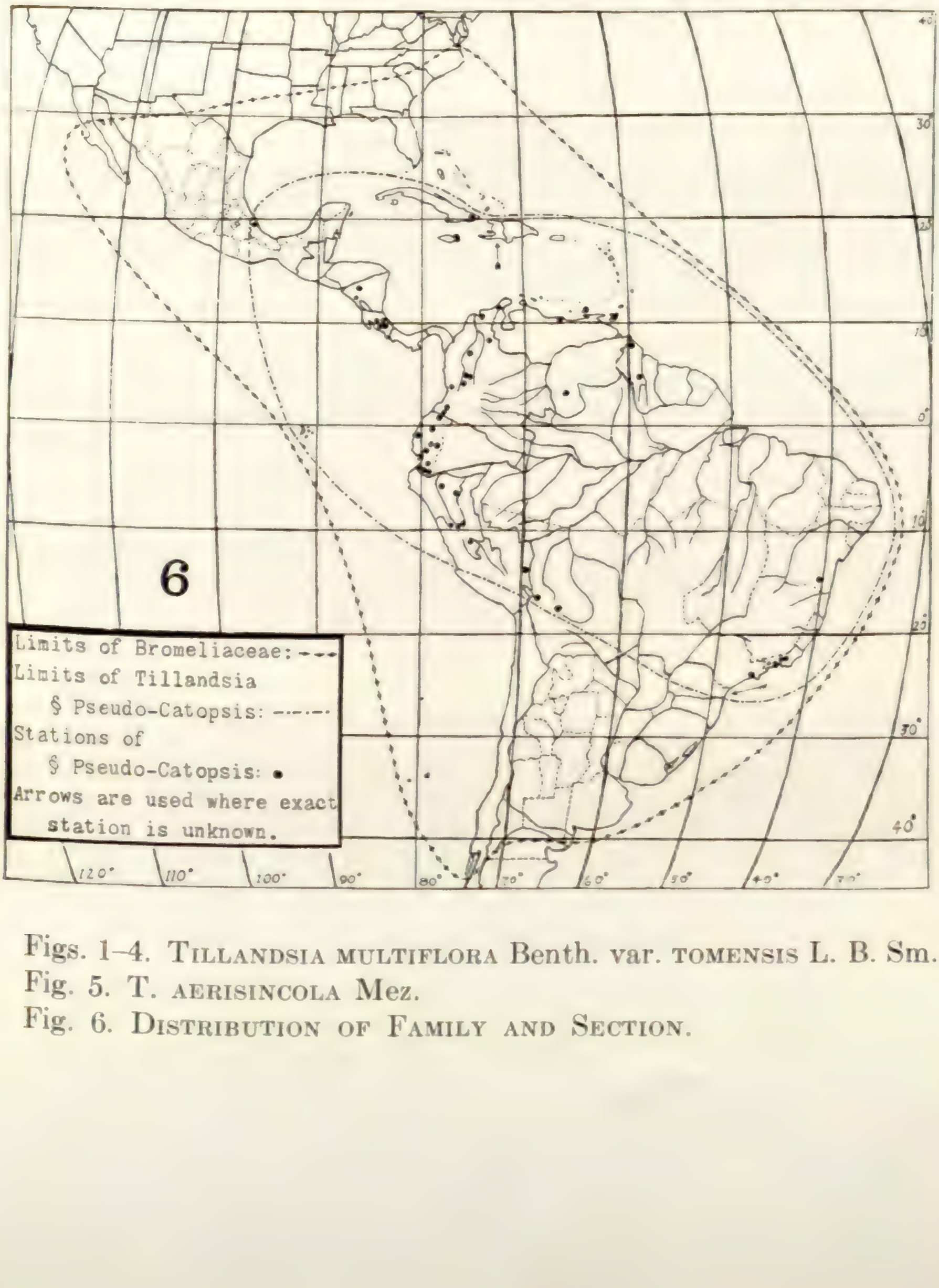


3

Figs. 1–2. TILLANDSIA CYLINDRICA Wats.
Figs. 3–4. T. CRENULIPETALA Mez.
Figs. 5–7. T. CHONTALENSIS Bak.

Fig. 1. TILLANDSIA SUBIMBRICATA Bak.
Figs. 2–5. T. HITCHCOCKIANA L. B. Sm.





Figs. 1–4. TILLANDSIA MULTIFLORA Benth. var. TOMENSIS L. B. Sm.
Fig. 5. T. AERISINCOLA Mez.
Fig. 6. DISTRIBUTION OF FAMILY AND SECTION.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY.

XC.

ISSUED AUG 1 1930

I. Records preliminary to a general treatment of the Eupatorieae—VIII 3
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By B. L. Robinson.

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RECORDS PRELIMINARY TO A GENERAL TREATMENT OF THE EUPATORIEAE—VIII.

LIKE earlier papers of this series the one here presented aims to put on record diagnoses of such novelties and details of such synonymic changes, range extensions and other taxonomic matters as have come to light during the author's continued work on the *Compositae-Eupatoricae*. The method is so similar to that pursued in previous issues of these notes and the origin of the material examined is so fully stated in the notes themselves that no special summary of the very numerous sources of information need here be attempted.

Ophryosporus angustifolius, spec. nov., fruticosus glaber; caule subtereti purpurascenti-brunneo 4–5 mm. diametro albo-medulloso; internodiis usque ad 9 cm. longis; ramis oppositis gracilibus patenter adscendentibus; internodiis quam folia brevioribus 5–20 mm. longis; foliis oppositis anguste lanceolatis attenuatis basi cuneatis argute subremoteque serrulatis a basi trinervatis utrinque viridibus et glabris 3–5 cm. longis 3–6 mm. latis pellucide puncticulatis et paullo pellucide reticulatis; petiolo ca. 2 mm. longo; paniculis et terminalibus et axillaribus ovoideis 2–7 cm. longis 1.5–5 cm. diametro subdensis foliaceo-bracteatis; bracteis ramulos paniculae superantibus; capitulis minimis breviter pedicellatis vix 3.5 mm. longis; involucri squamis 4 ellipticis vel obovato-oblongis ciliolatis dorso glabris; corollis glabris albis; tubo et faucibus ca. 1.5 mm. longis; lobis 5 deltoideis patentibus ca. 0.7 mm. longis; antheris apice omnino exappendiculatis; styli ramis apice nigrescentibus et conspicue incrassatis; achaeniis nigris glabris 1.2 mm. longis; pappi setis ca. 18 inaequalibus 1–1.5 mm. longis albis.—BOLIVIA: Cerro La Negra, Dept. Santa Cruz, 9 Oct. 1928, *José Steinbach*, no. 8187 (TYPE, in Gray Herb.). A species to be readily distinguished from its previously described congeners by its very small heads and exceptionally narrow leaves.

Ophryosporus serratifolius (HBK.), comb. nov. *Mikania serratifolia* HBK. Nov. Gen. et Spec. iv. 138 (1820). *Eupatorium serratifolium* (HBK.) DC. Prod. v. 181 (1836); Robinson, Proc. Am. Acad. liv. 310 (1918). This problematic plant, doubtfully believed to have come from the vicinity of Mariquita in Colombia, has never been rediscovered. It has been known to the writer many years from a small and rather poor photograph of the type. During a recent visit to the Museum of Natural History in Paris he was most kindly permitted to dissect one of the many heads on the rather fragmentary type-specimen and found that the anther-tips were wholly unappendaged and that the style-branches were abruptly clavate quite in the

manner of *Ophryosporus*, to which the species clearly belongs. It has proved impossible, however, to identify the plant with any described *Ophryosporus*, though it rather closely approaches some phases of *O. chilca* (HBK.) Hieron. and *O. origanoides* var. *microcephalus* Hieron. From the former it differs in having leaves with somewhat more numerous though less sharp and salient teeth and in having its phyllaries rounded at the tip instead of acutely or at least obtusely pointed. From *O. origanoides* var. *microcephalus* it differs in being smoother throughout and in having its phyllaries oblong, round-tipped and erose-ciliolate instead of oblanceolate, obtusely pointed and villous-ciliate. It also rather closely approaches but does not satisfactorily match *Eupatorium affine* HBK., a plant which is clearly an *Ophryosporus* and probably only a broadish-leaved form of *O. chilca*. Until closely matched by modern, more copious and better material, *O. serratifolius* cannot be very satisfactorily placed specifically, but it may be appropriately removed from either *Mikania* or *Eupatorium* and given at least a provisional status in the genus to which it obviously belongs.

Alomia coelestina (Regel), comb. nov. *Phalacraea coelestina* Regel, Gartenfl. iii. 388, t. 107 (1854). *Piqueria coelestina* (Regel) Hieron. in Engl. Bot. Jahrb. xxix. 3 (1900); Robinson, Proc. Am. Acad. xlii. 16 (1906). This plant was originally described from material raised in the Botanic Garden at Zürich from seed accidentally brought there in soil about the roots of bromeliads and orchids supplied by Warscewicz and supposed to have come from Peru. It has remained a problematic plant and no rediscovery of it in nature has been reported. Though he placed it in *Phalacraea* Regel implies doubt as to its generic affinities and fails to mention or figure the anther, which should furnish a diagnostic character of crucial significance, for if the anther is exappendiculate the plant must be referred to *Piqueria* while if its anther is apically appendaged the species should be placed in *Alomia*. Hieronymus (l. c.) in a rather obscure fashion transferred the plant from *Phalacraea* to *Piqueria* but made no mention of any personal examination of authentic material and no such material was found at Berlin by the writer in 1905 when revising *Piqueria*.

Among the many interesting plants collected by Messrs. Killip and Smith on their recent journey through northeastern Colombia there is one which so closely corresponds to Regel's description and plate as to leave scarcely a doubt of specific identity. It is an herb 6–12 dm. high with whitish to pinkish-blue corollas and purplish-blue style-branches, growing in a thicket near Charta, alt. 2000–2600 m., Dept. Santander, Feb. 1–11, 1927, *Killip & Smith*, no. 19,117 (Gr.). Ex-

amined as to its floral as well as its foliar and habital characters this plant corresponds so completely with the one described and figured by Regel as *Phalacraea coelestina* that it becomes impossible to escape conviction that it actually represents the long lost species. However, the anthers have a well developed apical appendage, showing that the plant should be referred to *Alomia* rather than to *Piqueria*.

As to the geographic source of the original material, there would now seem to be grounds for doubt whether it really came as stated from Peru. It has never been rediscovered there though many different parts of Peru have been diligently explored by subsequent collectors. On the other hand it now appears to have been found in Colombia, a country also visited by Warscewicz, who was a horticultural rather than botanical collector, interested primarily in plants of decorative value and probably less attentive to the phytogeographic aspects of his own collections than to their horticultural qualities. In the light of these facts it seems clear that the Peruvian origin of this casually introduced plant was at best merely inferential and probably erroneous.

Ageratum (§ **Euageratum**) **ellipticum**, spec. nov., annuum erectum gracile inconspicue setoso-villosum 3–5 dm. altum; radice fibrosa; caule tereti ca. 1.3 mm. diametro paucirameo subadpresse vel incurvate puberulo; internodiis valde elongatis usque ad 13 cm. longis; foliis oppositis petiolatis ellipticis apice rotundatis vel acutiusculis margine obscure undulatis vel subcrenatis vel integerrimis basi cuneatis 3-nerviis in nervis et in margine plus minusve setoso-ciliatis utrinque viridibus membranaceis 2–4 cm. longis 1–1.4 cm. latis; petiolis 7–10 mm. longis planiusculis in margine setoso-ciliatis; corymbis parvis pauci-capitulatis ramos terminantibus 2–5 cm. diametro; capitulis graciliter pedicellatis ca. 40-floris 5 mm. altis 7 mm. diametro; involucri squamis lanceolatis attenuatis viridibus obscure subciliatis aliter glabris 2-nervatis ca. 4 mm. longis 0.8–1 mm. latis; corollis et styli ramis lilaceis; achaeniis nigris ad angulos paullo scabratis 1.2 mm. longis; pappi squamis 5 basi expansis scariosis plus minusve laceratis ad apicem versus in aristam attenuatis corollas subaequantibus.—BRITISH HONDURAS: Vicinity of Tower Hill, 1928, *J. S. Karling*, no. 31 (Gr.); Honey Camp in the coastal region, Sept. 1929, *C. L. Lundell*, no. 512 (TYPE, in Gray Herb.).

Both specimens of this plant were received for determination from the Field Museum. In foliage it somewhat resembles *A. radicans* Robinson for which it was at first taken, but the second specimen, collected by Mr. Lundell, clearly shows it to be an erect annual, and from this striking difference of habit, as well as its more elongated

internodes, ciliate leaves and more elliptic leaf-blades it seems clearly distinct.

Stevia amambayensis, spec. nov., herbacea perennis vel suffrutescens erecta ca. 5 dm. alta post exsiccationem pallide rufescens; caule tereti ad inflorescentiam folioso breviter incurvo-puberulo; radice e fibris duris gracilibus numerosis composita; internodiis plerisque 7–20 mm. longis; foliis oppositis sessilibus subrhombeo-obovatis obtusis vel subacutis crenulatis ad basin versus integris cuneato-angustatis 1.5–3 cm. longis 1–1.5 cm. latis firmiter membranaceis supra brevissime puberulis subtus vix pallidioribus incurvo-puberulis punctatis a puncto paullo supra basin 3-nervatis laxe reticulatis; inflorescentia multiramea; ramis (inferioribus oppositis supremis saepe alternis) elongatis cum foliis paucis reductis bracteatis simplicibus vel iterum ramosis ad apices capituliferis; capitulis ca. 8 mm. longis ternis vel quinis aggregatis; pedicellis 1–3 mm. longis; involucri squamis lanceolato-oblongis acutis ca. 6 mm. longis et 1.4 mm. latis tenuissime griseo-villulosis et cum glandulis sessilibus aspersis; corollae tubo ca. 5 mm. longo gradatim sursum ampliato sine faucibus distinctis verisimiliter pallide roseo cum glandulis paucis lucidis ornato, limbi lobis breviter oblongis obtusis dorso obscure puberulis ca. 1 mm. longis verisimiliter albis; achaeniis simillibus 1.5 mm. longis (vix maturis); pappi aristis 14–17 ca. 4.5 mm. longis.—PARAGUAY: on plateau and slopes of the "Sierra de Amambay," January 1908, *T. Rojas*, no. 10,111 b. (TYPE, in herb. Brit. Mus., isotype, Brl.).

In foliage and general habit near *S. Balansae* described below, but having a much looser inflorescence, more finely toothed leaves, much more delicate pubescence and (in dried state) a peculiar pale reddish color.

S. amblyolepis (Robinson), comb. nov. *S. monardaefolia* var. *amblyolepis* Robinson, Proc. Am. Acad. xxxv. 326 (1900). The excellent phyllary-characters of this plant as well as its detached range indicate that it should be ranked as an independent species rather than varietally appended to the more southern *S. monardaefolia*. Of *S. amblyolepis* two varieties may be distinguished as follows:—

Var. **typica**, foliis gradatim attenuatis vel subcaudato-acuminatis basi subtruncate ad petiolum cuneatim alatum contractis; achaeniis omnibus exaristatis; adelphocarpiis cum coronula continua crateriformi ornatis; idiocarpio cum squamulis paucis brevissimis subdistinctis coronato.—MEXICO: Parral, Chihuahua, *Goldman*, no. 116 (TYPE, Gr.), *Pringle*, no. 13,652 (Gr.).

Var. **umbratilis**, var. nov., foliis ad apicem versus acutatis sed non conspicue attenuatis ad basin versus subgradatim angustatis;

achaeniis 1–2 in capitulo omni saepissime 1–2-aristatis.—MEXICO: Chihuahua, *Pringle*, no. 743 (TYPE, in Gray Herb., isotypes BM., Par., Brl.).

S. ammotropha, spec. nov., suffruticosa 0.5–1.5 m. alta erecta primo aspectu sublaevis sed breviter crispeque puberula; caule tereti rubro-brunnescenti fistuloso; foliis oppositis lanceolatis obtusis remote obtuseque serratis a basi integra attenuata subsessilibus membranaceis utrinque viridibus incurvo-puberulis subtus vix pallidioribus punctatis 5–7 cm. longis 6–10 mm. latis; inflorescentia paniculata pyramidata composita foliaceo-bracteata ca. 4 dm. alta 2.5 dm. diametro; capitulis 8.5–9 mm. longis ad apices ramorum fastigiato-corymbulosis breviter pedicellatis; pedicellis incurvo-puberulis, pilis eglandulosis; involucri squamis lanceolatis acutis tenuibus viridibus tenuiter villulosis et cum glandulis sessilibus lucidis sparse ornatis; corollis albis sparse granulatis et in limbo hirtellis; achaeniis subhomomorphis 15–21-aristatis sparse cum glandulis sessilibus munitis ca. 2.5 mm. longis; pappi aristis stramineis vel violascentibus barbellatis 5 mm. longis.—PARAGUAY: in sandy places on the bank of a stream in vicinity of Caaguazu, *Hassler*, no. 9347 (TYPE, in Gray Herb., isotypes, Univ. Gen., BM.).

From *S. entreriensis* Hieron. this differs in its narrower less coarsely pubescent leaves, pyramidal inflorescence, and incurved-villulose rather than glandular-puberulent phyllaries. From the also habitally similar *S. Rebaudiana* (Bertoni) Hemsl. the present species can be readily distinguished by its longer, thinner, and less nervose leaves, which lack any suggestion of the saccharine taste characteristic of *S. Rebaudiana*. *S. ammotropha* in many respects approaches the Brazilian *S. collina* Gardn. but has a more leafy-bracted inflorescence and achenes which are not at all pilose toward the summit as described by Gardner for his species.

S. apensis, spec. nov., herbacea vel suffrutescens erecta ca. 1 m. alta; caule tereti atropurpureo breviter incurvo-puberulo supra mediam partem adscendenter ramoso; foliis oppositis sessilibus anguste rhombeis margine a medio crenato-serratis apice obtusis ad basin versus integerrimis gradatim cuneatis a basi conspicue trinervatis textura firmiter membranaceis supra glaberrimis vel rariter praesertim ad marginem versus sparse hirtellis subtus pallidioribus impunctatis in superficie glabris in nervis cum pilis albis brevissimis patentibus munitis 2.5–4.3 cm. longis 6–10 mm. latis; panicula composita valde convexa vel subpyramidata foliaceo-bracteata; cymis partialibus in ramis terminalibus densis; pedicellis 0–3.5 mm. longis; involucri squamis viridibus lanceolati-linearibus acutis sublaxis patenter pilo-

sulis vel subsetulosis 7–8 mm. longis, pilis albis eglandulosis; corollis ut videtur rubello-purpureis, limbo hirtello; achaeniis similibus maturitate nigrescentibus 2.6 mm. longis sparse minuteque glanduloso-scabratis; pappi aristis 13–19 stramineis barbellatis 4–4.5 mm. longis ad basin versus paullo dilatatis.

NORTHERN PARAGUAY: in calcareous region of the upper Apa River, *Hassler*, no. 11,079 (TYPE, Univ. Gen.).

This is one of several plants of Paraguay and the Argentine Republic which in herbaria have been referred to the Brazilian *S. polycephala* (Sch.-Bip.) Bak. The latter plant, however, was founded on material still uncertain as to its unity and precise identity and supposed to range from Minas Geraës to Paraná, the name in any event being inadmissible on account of an earlier and still valid homonym, *S. polycephala* Bertolini of Central America.

S. apensis differs from *S. ammotropha*, described above, by having shorter, relatively broader, and somewhat firmer leaves, which are almost impunctate and nearly smooth except for short spreading white hairs of stiffish nature chiefly on the nerves beneath, while in *S. ammotropha* the puberulence is much finer, more copious and incurved and the surface is distinctly dark-punctate. Similarly on the phyllaries of *S. ammotropha* the hairs are very slender and incurved, while in *S. apensis* the phyllaries are beset with distinctly coarser, stiffer and more spreading hairs.

S. apensis is also close to *S. Balansae* Hieron., described on p. 83. However, the latter is a plant of lower growth, denser inflorescence and more copious soft spreading villous pubescence, which covers both surfaces of the leaves.

S. ARISTATA D. Don in Hook. & Arn. Comp. Bot. Mag. i. 238 (1836). A smaller-leaved and more glandular variety, which seems to belong to this species, occurs in Paraguay. It may be differentiated from the typical variety as follows.

Var. α. **typica**, foliis plerisque 4–6 cm. longis et 1–2 cm. latis; involucri squamis incurvo-puberulis cum pilis eglandularibus sed cum glandulis paucis lucidis sessilibus interspersis.—Argentina, Uruguay and Paraguay.

Var. β. **villaricensis**, var. nov., foliis (etiam caulinis principibus) 2–3 cm. longis 7–10 mm. latis; pedicellis et involucri squamis brevissime glandulari-puberulis, pilis paucis eglandularibus aliquando intermixtis.—PARAGUAY: very common on plains, Villa Rica, *Jörgensen*, no. 4267 (TYPE, in Gray Herb.).

S. COLLINA Gardner in Hook. Lond. Journ. Bot. v. 458 (1846). The interpretation of this species by Baker in the Flora Brasiliensis,

vi. pt. 2, 206, t. 57 (1876) seems to have been quite erroneous. Gardner states that the leaves of his plant, no. 4839 (3), were oblong-lanceolate, 2 inches long and 6–7 lines wide. Baker, on the other hand figures as *S. collina* a plant with broadly ovate leaves by no means 2 inches long and rather more than two-thirds as wide as long. Gardner described the leaves of his plant as being green above and pale beneath. In most of the material referred by Baker to *S. collina* the leaves are grayish-green on both surfaces with little contrast in the depth of color. Baker states that the stem of the species was leafy to the summit. This is by no means true of Gardner's type, as shown by the specimen at the British Museum, for it has the upper part of the stem developed into a sparingly bracteate peduncle. Gardner describes the pedicels of his plant as glandular-pilose, while in the plant figured by Baker they are covered with spreading attenuate jointed glandless hairs. Finally Gardner remarks that the achenes in his plant were somewhat pilose at the summit, but Baker's illustration shows achenes evenly hispid on the ribs from the base upward.

It is therefore clear that the plant which was chiefly described and was certainly figured by Baker does not correspond with the type of *S. collina* Gardn. It happens that this plant, mistakenly referred by Baker to *S. collina*, proves to be one of the most abundant and readily recognized Stevias of Brazil. The writer has long hesitated to characterize the plant as new but sees no alternative if the many specimens are to receive proper classification and intelligible labelling. The plant in question may be put on record as follows.

S. commixta, spec. nov., herbacea vel basi suffruticosa erecta simplex vel superne adscendenter ramosa 6–12 dm. alta ubique griseo-pilosa vel -tomentella, pilis incurvis vel crispis attenuatis nodosis eglandulosis griseis paullo erubescentibus vel fulvescentibus; caule tereti plerumque brunneo folioso ca. 4 mm. diametro; medulla brunnescenti; foliis oppositis breviter petiolatis vel subsessilibus late rhombeo-ovatis obtusis vel subacutis crenato-serratis (basi cuneata integra excepta) subconcoloribus utrinque incurvo-pilosis plerisque 2–3.5 cm. longis 1–2 cm. latis membranaceis; inflorescentia terminali primo densa ovoidea mox corymbosa planiuscula 8–12 cm. diametro; pedicellis saepissime involucro multo brevioribus patenter griseo-pilosis; capitulis ca. 9 mm. longis; involucri squamis oblongo-lanceolatis acutis ca. 7 mm. longis dorso griseo-pilosis saepe erubescentibus inconspicue 3-nervatis cum glandulis sessilibus plus minusve ornatis; corollis albidis (vel in faucibus ca. 3 mm. longis aliquando roseis vel purpureis?); limbi hispidi dentibus oblongo-ovatis ca. 1 mm. longis; achaeniis homomorphis 3 mm. longis 5–8-costatis in costis brevissime

sursum hispidulo-scabratis; pappi aristis 17–21 stramineis corollae subaequalibus brevissime scabratis.—*S. collina* Bak. in Mart. Fl. Bras. vi. pt. 2, 206, t. 57 (1876) as to plant illustrated and most of material cited but certainly not as to type of Gardner.—BRAZIL: Paraná: on grassy plains, Jaguariahyva, alt. 740 m., *Dusén*, no. 16,760 (Gr.). São Paulo: São Paulo, *Löfgren*, no. 16,205 (TYPE, in Gray Herb.); Butantan, *Hoehne*, nos. 67 (Inst. Biol. S. Paulo), 1081 (Gr.), and 3401 (Inst. Biol. S. Paulo); Ypiranga, *Usteri*, no. 16,207 (Gr.), *Luederwaldt*, no. 16,200 (Gr.); Botanic Garden of São Paulo, *Hammar*, no. 16,210 (Gr.); Araraguara, *Löfgren*, no. 16,212 (Inst. Biol. S. Paulo); Ytú. *Lund* (Copenh., fragm. Gr.). Minas Geraës: *Riedel* (Gr.).

Material of this rather common plant of southern Brazil has long been present in herbaria and has been mixed with several other species besides *S. collina*. For instance, with *S. menthaefolia* Sch.-Bip., which has larger leaves glabrous above, different inflorescence, and fewer pappus-awns, with *S. resinosa* Gardner, a species with oblong leaves and awnless or few-awned pappus, with *S. urticaefolia* Billb., a plant with open panicle, long-pedicelled heads, and awnless pappus, and with *S. Gardneriana* Bak., a species of considerable similarity of habit but differing in its harsher, thicker, conspicuously reticulated leaves and somewhat more exserted florets.

The closest relative of *S. commixta* would appear to be *S. hyptifolia* Gardn., which exhibits a somewhat striking correspondence with it in several details of involucre, pappus, and pubescence. However, *S. hyptifolia* is shown by its type (Gardner's no. 4203) to be a more slender plant with rather narrowly oblong leaves (scarcely a fourth as wide as long) and a somewhat fastigiate inflorescence in which the heads are borne on pedicels nearly as long as the involucre.

S. DISSITIFOLIA DC. Prod. v. 121 (1836). Since its publication this species has been obscure. No one seems to have reported its rediscovery in nature. No one appears to have associated with it any material of later date.

When visiting the Botanical Conservatory at Geneva in the summer of 1927, the writer had the type-sheet of the species photographed and was most kindly permitted to make the dissections needful to its more exact interpretation. Unhappily the material proved to be a mixture and the proper application of the name may well be subject to some difference of interpretation and practice. However, it seems worth while to put on record what was learned from the brief but fairly detailed examination of the type-sheet in the Prodromus Herbarium.

The sheet bears at the left two main stems each ending in a spreading-branched terminal inflorescence. These were found to be identical and may for purposes of discussion be termed Element A. Towards the base these stems are crossed by a band bearing in hand of A. P. de Candolle the words "Mexique. h. Martius." At the right is a third much shorter stem or more probably branch. This, which we may call Element B., is crossed at its base by a pocket bearing, also in the hand of A. P. de Candolle, the words "rameau lateral" and "Mexique, Haenke Nov. 1834." In the pocket were several loose achenes, apparently of Element A. These we may call Element C.

Element A. constitutes the major part of the material on the sheet and without doubt must have been the source of some of the characters mentioned in the original diagnosis. Thus, the branches are said to be "oppositis distantibus divaricatis," which correctly characterizes those of Element A, but would scarcely have been employed if the author had been looking merely at Element B, which, being only the upper portion of a branch, bears only two pairs of rather short and curved-ascending branchlets. The leaves are described as "4-5 lin. longa," that is to say 8-10 mm. in length. This is approximately the case with Element B, but in Element A leaves occur which are 24–29 mm. long. In this character it will be noted that it is the material attributed to Haenke rather than that said to come from the Martius herbarium that corresponds better with the description. On the other hand the internodes are said to be nearly 3 inches long, and this on the original sheet could apply only to Element A., namely that from the herbarium of Martius. Furthermore, the involucral scales are described as acuminate. They are so in Element A., but in Element B. they are barely acutish. The other traits mentioned are common to both Elements A. and B.

The differential characters which distinguish these plants may be summarized as follows:

Element A. (from herb. of Martius)	Element B. (coll. by Haenke)
Leaves very sparingly beset (chiefly on the nerves) with rudimentary stoutish hairs	Leaves nearly smooth above, finely pubescent along the nerves beneath with slender soft hairs
Leaves firm-membranaceous, nigrescent on both surfaces, nearly or quite impunctate	Leaves thinly membranaceous, light brown (in old dried specimen), paler and olivaceous beneath, distinctly punctate on lower surface
Heads 10.5 mm. long; achenes 4 mm. long	Heads 7 mm. long; achenes 2.5 mm. long
Phyllaries acuminate, spreading-glandular-puberulent	Phyllaries acutish, subappressed-puberulent with glandless hairs

Surely these differences are sufficient to indicate two distinct species. As to the systematic disposition of each, it may be said that Element A., though in many respects very close to *S. caracasana* DC. (*S. elliptica* Hook. & Arn.), differs in having entire leaves of somewhat more oblong form. It should here be stated that the specimens in both Elements A. and B. show only the upper (bracteal) leaves except for those of secondary axes. What the main cauline and basal leaves may have been like we do not know. In any event, even the upper, being quite entire, are sufficiently unlike the clearly crenulate or serrulate upper leaves of *S. caracasana* to suggest a probably different plant. As to Element B. (the lateral branch attributed to Haenke) it falls (by involucre, achenes, etc.) into the group with *S. rhombifolia* HBK. and presents no distinctions by which it can safely be separated from that widespread and variable species of earlier publication.

Element C., the achenes in the pocket crossing the base of Element B., appears as stated to be probably from Element A. They have the slightly greater size and, as described, have awns ranging from 3–6. Thus in this character again, DeCandolle seems likely to have drawn his details from Element A.

To summarize:—The plants on the type sheet in the Prodromus herbarium, being labelled and annotated in the hand of A. P. de Candolle himself, bear every evidence of being the actual material studied and described when the species was published. Element A., constituted the best portions of the material and yielded the major part of the characters recorded. Unhappily, however, De Candolle in indicating the source of his new species mentioned the Haenke specimen and failed to indicate that from the herbarium of Martius.

What is here to be regarded as the type?

The case does not appear to be one in which there has been any subsequent mixture of extraneous material at a later date. De Candolle obviously worked upon what is still preserved in his herbarium, drawing most of his data from the Martius material, but probably by some oversight omitting the mention of it when recording the more vague lateral branch attributed to Haenke. Either this branch, a scrap some 16 cm. long and quite destitute of foliage below the poorly developed lateral inflorescence, must be taken as the type and the species reduced to the probable synonymy of *S. rhombifolia;* or, proceeding on the principle that the true type of a species is the plant actually described by the author, it may be reasonably argued that the chief characters of De Candolle's new species seem to have been drawn from the material from the herbarium of Martius and therefore that this material, namely Element A., becomes *ipso factu* typical and

may continue to bear the name *S. dissitifolia*—a designation which seems to have been selected because of its long internodes, a feature which is striking in Element A. but scarcely so in Element B. At least until rediscovery of the species yields more ample indication of its traits and more precise knowledge of its geographic range, it seems the rational course to let the name *S. dissitifolia* stand for Element A., which appears to have constituted the major part of the material studied by De Candolle and to have suggested to him the descriptive name which he selected.

S. ELATIOR HBK. Nov. Gen. et Spec. iv. 144 (1820). Of this common and rather widely distributed species the following varieties may be distinguished.

Var. *α*. **typica**, foliis caulinis mediis et superioribus sessilibus vel subsessilibus; pappi aristis apud achaenia saltim 3 omnium capitulorum bene evolutis.—For literature, synonymy, range, and exsiccatae, see p. 97.

Var. *β*. **podophylla**, var. nov., foliis mediis et superioribus bene petiolatis; pappi aristis ut apud var. *typicam*—MEXICO: Agua Fria near San Luis Tultitlanapa, *Purpus*, no. 3132 (TYPE, in Gray Herb., isotypes, BM., U.S.); Tres Mogotes, alt. 2100–2450 m., *Purpus*, no. 3840 (Gr., BM., U.S.).

Var. *γ*. **dissoluta** (Schlecht.), comb. nov., pappi aristis nullis vel solum apud capitula pauca sparsa evolutis saepe unicis.—*S. dissoluta* Schlecht. Hort. Hallens. 16 (1841).—MEXICO: between Trojes and the Hacienda de la Trinidad, *Schiede*.

S. FIEBRIGII Hieron. in Engl. Bot. Jahrb. xl. 365 (1908). Of this slender, narrow-leaved and readily recognized species two fairly marked varieties may be distinguished:

Var. *α*. **typica**, erecta vel suberecta; foliis linearibus vel saepe lanceolato-linearibus, maximis aliquando usque ad 5 mm. latis et obscure dentatis; pappo achaeniorum omnium e squamis brevibus solis sistente vel apud achaenia paucissima cum aristis 1–2 corollam subaequantibus ornato.—BOLIVIA: Toldos near Bermejo, *Fiebrig*, no. 2330a (Brl., phot. Gr.); Pajonales, Micoya, *Pearce* (K.).

Var. *β*. **gracillima**, var. nov., multo gracilior ut videtur recumbens; foliis anguste linearibus integerrimis; pappo apud adelphocarpia e squamis brevibus et 3–5 aristis corollam subaequantibus sed apud idiocarpium e squamis solis exaristatis composito.—ARGENTINA: Salta: among stones at La Candelaria, alt. 1500 m., *Venturi*, no. 3679 (TYPE, in Gray Herb.).

S. hypomalaca, spec. nov., erecta virgata perennis 8–15 dm. alta; caule velutino-tomentoso ubique dense folioso; foliis alternis sessilibus

anguste oblanceolato-oblongis ad apicem versus obsolete crenato-serratis basi cuneatim angustatis supra densissime griseo-puberulis subtus molliter albo-tomentosis membranaceis 3 cm. longis 5–8 mm. latis saepissime deflexis plerisque ex axillis proliferentibus; corymbo terminali convexo 9–12 cm. diametro; capitulis ca. 1 cm. longis; pedicellis 1–3 mm. longis; involucri squamis pallide viridibus dorso dense griseo-puberulis vel -tomentellis et aliquando cum glandulis sessilibus ornatis; corollis albis; achaeniis heteromorphis, eorum quattuor coronulatis et 5-aristatis sed quinto exaristato.—Mexico: Morelos: mountainside above Cuernavaca, alt. about 2000 m., *Pringle*, nos. 6603 (type, in Gray Herb., isotype K.) and 9976 (Gr.).

At first supposed to represent *S. canescens* HBK., which however has proved to be a mere form of *S. serrata* var. *ivaefolia* (Willd.) Robinson in which the leaves are very much less pubescent and distinctly punctate beneath. In the plant here described the leaves are somewhat thicker, much more discolorous, and show no punctation on the lower surface, since glands if they occur are wholly hidden by the dense indumentum.

S. Liebmannii Sch.-Bip. ex Klatt, Leopoldina, xx. 75 (1884). Of this species two varieties may be distinguished, as follows:

Var. α. **typica**, capitulis 12–14 mm. longis; corollis purpureis vel in faucibus violaceis.—For literature, synonymy, range, and exsiccatae, see p. 96.

Var. β. **chiapensis**, var. nov., capitulis paullo minoribus 10–11 mm. longis; corollis in limbo albis vel albidis sed in faucibus virescentibus.—Mexico: Hacienda Montserrate, Chiapas, *Purpus*, no. 9100 (type, in Gray Herb.).

S. Lilloi, spec. nov., herbacea erecta perennis 1 m. alta; caule tereti usque ad inflorescentiam folioso; medulla alba; foliis oppositis petiolatis ovatis caudato-acuminatis grosse obtuseque serratis profunde cordatis 7–9 cm. longis 4–5 cm. latis firmiter membranaceis utrinque tenuiter adpresso- vel incurvo-puberulis subtus paullo pallidioribus; petiolo ca. 1.5 cm. longo ad summum versus anguste alato; corymbo terminali rotundato denso e glomerulis plerisque contiguis composito; capitulis sessilibus 9 mm. longis; involucri squamis lanceolato-linearibus acutis 7 mm. longis dorso incurvo-puberulis; corollis (ut dicitur) rubris cum pilis brevibus crispis vel incurvis eglandularibus subdense obtectis; tubo proprio ca. 1 mm. longo; faucibus subcylindratis 3 mm. longis; dentibus limbi ovato-oblongis obtusis 1.4 mm. longis 0.8 mm. latis; achaeniis subhomomorphis ca. 2.5 mm. longis; pappo achaeniorum omnium e squamis brevibus scariosis et 1–2 aristulis (1–3 mm. longis) composito.—Argentina: Tucumán: in primeval forests, Alto

de Medina, alt. 1460 m., *Herb. of M. Lillo*, no. 15,924 (TYPE, in Gray Herb.).

This species is manifestly close to forms of the somewhat variable *S. alpina* Griseb. but differs clearly in the contour, puberulence and veinlets of its leaves, for these are conspicuously and deeply cordate, have the lower surface covered with a short but rather dense and persistent puberulence, and are obscurely if at all marked by veinlets lighter in color than the surface of the areolae, while in *S. alpina*, the leaf-base is obtusely to acutely narrowed, the lower surface subglabrous (except on the nerves and chief veins) and the clear network of veinlets darker than the areolae.

It is a pleasure to name this stately species for Professor Miguel Lillo to whose kindness I am much indebted and whose scholarly researches on the flora of the Argentine Republic are widely known.

S. LUCIDA Lag. var. **pueblensis**, var. nov., a var. *typica* differt foliis 3-nervatis elliptico-ovatis obtusis proportione brevioribus et latioribus, saepe vix longioribus quam latis.—MEXICO: Puebla: on rocks, vicinity of San Luis Tultitlanapa, *Purpus*, no. 3036 (Gr.). Vera Cruz: Maltrata, alt. 1700, *Seaton*, no. 389 (Gr.).

S. melancholica, spec. nov., perennis minute crispeque puberula 4 dm. vel ultra altitudine per exsiccationem nigrescens; caule tereti ca. 3 mm. diametro medulloso; internodiis ca. 4 cm. longis; foliis oppositis petiolatis saepe maturitate deflexis rhombeo-ovatis subacutis crenato-serratis basi cuneata integerrima excepta supra juventate obscure hirtellis subtus paullo pallidioribus glabriusculis puncticulatis firmiter membranaceis a basi trinervatis 4–5.5 cm. longis 2–3.6 cm. latis; petiolo 5–8 mm. longo; corymbo terminali subalternirameo planiusculo densiusculo fastigiato; pedicellis plerisque ca. 3 mm. longis; capitulis ca. 12 mm. longis; involucri squamis anguste oblongis abrupte acutatis 5–6 mm. longis sparse crispeque puberulis; corollae tubo proprio 1.5 mm. longo gracili; faucibus atropurpureis gradatim sursum ampliatis 4.5 mm. longis; dentibus limbi 5 oblongis pallidis verisimiliter albescentibus 1.5 mm. longis; adelphocarpiis 3 quoque cum aristis 6–8 (5.5 mm. longis sursum barbellatis) et squamellis paucis brevibus ornato; idiocarpiis 2 cum squamellis acutis ca. 0.3 mm. longis solis coronatis; achaeniis gracilibus glabris deorsum attenuatis basi calcaratis ca. 4 mm. longis.—BOLIVIA: without stated locality, 1847, *Bridges* (TYPE, in herb. Brit. Mus., phot. in Gray Herb.).

This plant belongs to a rather small group of the heterocarpous species which have relatively large rhombic-ovate leaves and pluriaristate adelphocarps. Among its nearest relatives may be mentioned the Peruvian *S. cajabambensis* Hieron. (with inflorescence less compact,

adelphocarps 8–11-aristate, single idiocarp and longer corolla), the Peruvian *S. puberula* Hook. (a more slender plant with more open inflorescence, thinner rounder leaves and 4 adelphocarps each 9–11-aristate) and the Brazilian *S. menthaefolia* Sch.-Bip. (a much more pubescent species with more openly branched inflorescence and attenuate phyllaries. The name alludes to the sombre appearance of the type owing both to its nigrescent nature and deflexed leaves.

S. MERCEDENSIS Hieron. in Engl. Bot. Jahrb. xxii. 735 (1897). The collections now at hand indicate that this species passes to narrow-leaved forms rather closely simulating *S. satureiaefolia* (Lam.) Sch.-Bip. and to dwarfed states due to alpine conditions at high altitudes. Variations based on these foliar and habital traits might be made but would have little more than formal significance. However, there are also some differences in pubescence and achenes, which would seem worthy of recognition, as follows.

Var. α. **typica,** involucri squamis incurvo-puberulis, pilis eglandularibus saepius subadpressis; achaeniis heteromorphis, adelphocarpiis 4 cum aristis 7–13 ornatis, idiocarpio saepius exaristato rarius 1–3-aristato.—ARGENTINA: Provinces Catamarca, Tucumán, and Cordoba, apparently frequent.

Var. β. **glanditecta**, var. nov., involucri squamis cum pilis brevissimis firmiusculis patentibus apice glandulari-capitatis munitis; achaeniis et pappi aristis ut apud var. *typicam.*—ARGENTINA: Prov. Tucumán: El Molle, Amaicha, *Castillon*, no. 3122 (Gr.); El Chorro a las Arcas. Dept. of Trancas, alt. 2200 m., *Schreiter*, no. 5688 (Gr.). Prov. Jujuy: among stones on mountain slopes, Tilcara, *Venturi*, no. 4868 (Gr., Mo.).

Var. γ. **Pereyrae**, var. nov., involucri squamis ut apud var. *glanditectam* sed achaeniis homomorphis exaristatis cum squamis brevibus solis coronatis.—ARGENTINA: Prov. Jujuy: Guasamayo, Dept. of Tilcara, alt. 2470, *Pereyra*, no. 5823 (Gr.).

S. OBOVATA Rusby, Mem. Torr. Bot. Club, vi. 55 (1896). Until recently no collection of this species had been made (or at least had been reported) since its discovery by Bang. Its type had a pappus consisting chiefly of hyaline or slightly stramineous scales. These were erose or toothed, blunt or acute, about 0.4 mm. long and more or less connate at base. One or two of them on each of 3–4 achenes usually surpassed the others, becoming cusplike, more attenuate and 0.6–0.8 mm. long without much change of color or texture, while on 1–2 of the achenes these longer and more acute awns were developed into purple awnlets as much as 1.4 mm. long (scarcely one third the length of the corolla). In Steinbach's recent Bolivian collection there is a plant so

closely corresponding to the original material of *S. obovata* as to be convincingly conspecific yet differing so markedly in its pappus as to justify varietal distinction. The two tendencies of the species may be put on record as follows:

Var. *α.* **typica**, pappo exaristato e squamulis erosis obtusis vel acutis 0.4–0.8 saepe cum aristula purpurea usque ad 1.4 mm. longa composito.—*S. obovata* Rusby, l. c.—BOLIVIA: Vic. Cochabamba, *Bang*, no. 1027 (N. Y., Gr., BM., Brl.).

Var. *β.* **aristifera**, var. nov., habitu, foliis, inflorescentia, etc. var. *typicae* simillima differt achaeniis dimorphis omnibus non solum cum squamulis coronatis sed etiam bene aristatis, eorum 4 cum aristis 5 ornatis et 1 (idiocarpio) cum aristis 3 munito; aristis atropurpureis corollam subaequantibus.—BOLIVIA: Cochabamba: Prov. Chapare: grassy places near Aduana, Coloni, alt. 2800 m., Jan. 18, 1929, *Steinbach*, no. 8831 (Gr.).

S. ophryophylla, spec. nov., herbacea vel ad basin versus plus minusve frutescens 4–7 dm. alta erecta vel aliquando decumbens; caule tereti saepe purpureo usque ad inflorescentiam folioso dense brevissime crispeque puberulo et sparse patenter villoso vel setifero et etiam cum glandulis sessilibus ornato; internodiis plerisque 1–2.5 cm. longis; foliis caulinis oppositis ovatis vel ovato-oblongis obtusis crenato-serratis ad basin versus integris et in partem petioliformem cuneatim angustatis membranaceis 2–4.5 cm. longis 1–2.3 cm. latis vix subtus pallidioribus densissime puncticulatis in margine et utrinque in costa venisque cum pilis longis setiformibus patentibus munitis; inflorescentia adscendenter ramosa laxiuscula corymboso-paniculata; pedicellis gracilibus atropurpureis densissime cum glandulis minutis breviter stipitatis ornatis; capitulis ca. 1 cm. longis; involucri squamis lineari-oblongis vel -oblanceolatis acutis 4–5.5 mm. longis plerumque purpurascentibus dense brevissimeque glandulari-puberulis; glandulis vinaceis; corollis in faucibus (ca. 3.5 mm. longis) atropurpureis; limbo multo pallidiori extus hispidulo; achaeniis homomorphis 3 mm. longis glandulari-scabratis; pappi aristis 17–19 atropurpureis scabratis 5.5 mm. longis.—BRAZIL: São Paulo: Ypiranga, 25 Mar. 1908, *Luederwaldt* (Inst. Biol. S. Paulo, no. 16,351); Villa Mariana, *A. Usteri* (Inst. Biol. S. Paulo, no. 16,204); Jabaguara, 8 Mar. 1914, *Brade*, no. 7084 (Inst. Biol. S. Paulo, no. 6111), TYPE, in Gray Herb.

This species was found in material most kindly submitted by Professor Hoehne. In the existing confusion of the Brazilian Stevias it might perhaps have been referred to the rather vague aggregate which Baker covered by the name *S. Veronicae*. However, it differs in many particulars from the true *S. Veronicae* DC. Its leaves are

broader and are crenate-serrate from nearer the base. They are more obtuse and are sparsely though rather conspicuously ciliate on the margin and along the midrib and veins, the hairs being rather long and setiform, attenuate, jointed, white, spreading, and glandless. The inflorescence is much more open than in *S. Veronicae*, and at maturity the florets become nearly or quite twice as long as the involucre which is not the case in *S. Veronicae*. The phyllaries are minutely stipitate-glandular and have very few and scattered longer glandless hairs if these are present at all, while in *S. Veronicae* spreading glandless hairs form the chief pubescence on the phyllaries. *S. myriadenia* Sch.-Bip., a plant in many respects similar to the plant here described, differs in having thicker, firmer leaves without ciliation but marked by a strong reticulation of distinctly exserted veinlets.

S. Purpusii, spec. nov. herbacea erecta perennis verisimiliter 5–7 dm. alta (basi ignota) adscendenter ramosa; caule tereti brunneo vel purpureo puberulo vel subtomentello; foliis oppositis petiolatis ovatis obtusis serratis sed ad basin versus primo abrupte rotundatam vel contractam deinde gradatim cuneatam integris membranaceis 2.5–4 cm. longis 1.5–2.5 cm. latis supra viridibus incurvo-puberulis subtus multo pallidioribus griseo-tomentellis; capitulis 8–10 mm. longis sessilibus vel subsessilibus in corymbum terminalem convexum et in corymbos plures laterales dispositis; involucri squamis lanceolato-oblongis acutis viridibus vel paullo purpurascentibus cum glandulis minutis brevissime stipitatis dense ornatis ca. 5.8 mm. longis; corollis roseis in tubo faucibusque cum glandulis sessilibus sparsim munitis; lobis limbi anguste ovatis vel ovato-oblongis 1.5–1.8 mm. longis; achaeniis homomorphis gracilibus atrobrunneis in angulis paullulo scabratis aliter laevibus omnibus exaristatis solum cum coronula scariosa erosa 0.4–0.5 mm. alta munitis.—MEXICO: mountains above Cuernavaca, Morelos, alt. 2440 m., *Pringle*, no. 11,294 (TYPE, in Gray Herb.); dry hills, Salto de Agua, State of Mexico (?), *Purpus*, no. 1486 (Gr., BM.).

A species closely related to *S. elongata* HBK. and *S. monardaefolia* HBK., but with smaller, blunter and much more discolorous leaves.

S. SALICIFOLIA Cav. Ic. iv. 32, t. 354 (1797). The rather numerous varieties of this species are keyed and described below. (See page 108.) The following, not previously characterized, may be here given the Latin diagnosis required by the International Rules.

Var. **anathera**, var. nov., planta habitu var. *stenophyllae* (*S. stenophyllae* Gray) simillima, foliis anguste linearibus integerrimis, differt pappo coroniformi exaristato. —MEXICO: Zacatecas: near Concepcion del Oro, Palmer ('02) 401 (TYPE, in Gray Herb.).

Var. **virgulifera**, var. nov., ramis erectis vel adscendentibus vir-

gatis foliosis; foliis plerumque lanceolatis cum dentibus utroque 2–3 acutis instructis; achaeniis omnibus cum squamulis coronatis et aristis plerumque 1–3 munitis.—MEXICO: Durango: vicinity of the city, *Palmer* (coll. of 1896), nos. 29 (TYPE, in Gray Herb.) and 931 (Gr.); Tejamén, *Palmer* ('06) 481 (Gr.). Nuevo Læon: mountains, Monterey, *Pringle*, no. 10,812 (Gr.).

S. scabridula, spec. nov., ut videtur herbacea (basi ignota) perennis erecta griseo-puberula vel -tomentella superne alterniramea pyramidata; caule tereti atropurpureo sed a tomentulo griseo crispato vel incurvato dense tecto; foliis alternis et oppositis sessilibus subconcoloribus utrinque incurvo-puberulis scabriusculis trinerviis saepe conduplicatis, caulinis oblanceolatis saepe deflexis ad basin versus integris cuneatim angustatis supra medium obscure crenato-serrulatis apice subobtusis ca. 5 cm. longis 1 cm. latis; rameis anguste oblongis ca. 2 cm. longis 4–5 mm. latis; capitulis plerisque subsessilibus in glomerulos denses vel cymos fastigiatos in ramis terminales dispositis ca. 12 mm. longis 5-floris; involucri squamis lineari-lanceolatis acutis ca. 6 mm. longis pallide viridibus vel apice purpureo-tinctis; corollae tubo proprio ca. 1 mm. longo patenter hispidulo, faucibus purpureis, limbi dentibus albis dorso hispidulis; adelphocarpiis 3–4-aristatis in angulis et etiam in faciebus paullo hispidulis; idiocarpio paullo crassiori in angulis hispidulis sed in faciebus glabris a squamulis connatis erosis coronato exaristato.—MEXICO: Guadalajara, Jalisco, Oct. 1886, *Dr. Edward Palmer*, no. 692 (TYPE, in Gray Herb.).

This grayish-puberulent perennial with scattered sessile leaves and pyramidal panicle of fastigiately glomerate shortly pedicelled heads was distributed as *S. eupatoria* but may be readily distinguished by its much taller and more branching habit and by its much larger oblanceolate and closely puberulent cauline leaves.

S. Schreiteri, spec. nov., gracilis herbacea perennis super basin suberectam laxe recumbens; caule tereti ca. 1.5 mm. diametro rubescenti tenuiter griseo-puberulo (pilis incurvis eglandulosis) flexuoso ramoso ca. 4 dm. longo; internodiis plerisque 2–3.5 cm. longis; ramis curvato-adscendentibus flexuosis; foliis oppositis; lamina ex parte ampliata oblonga vel elliptica 2–3.5 cm. longa 1–1.8 cm. lata et ex parte petioliformi anguste cuneata 1.5–2.5 cm. longa integra composita; parte ampliata subintegra vel plus minusve grosse crenato-serrata obtusa tenuiter membranacea 3-nervata supra minute papillosa subtus vix pallidiori subglabra; inflorescentiis paucicapitulatis ramos terminantibus geniculatis sympodialibus; capitulis gracilibus ca. 1 cm. longis; involucri squamis linearibus acutis viridibus incurvo-puberulis; corollis albis; achaeniis homomorphis; pappo ex aristis pallidis 6–7

corollam paullo superantibus attenuatis deorsum paullo ad basin versus incrassatis et e squamis paucis scariosis ca. 0.7 mm. longis composito.—ARGENTINA: Salta: Dept. Orán: Zanja Honda, alt. 600 m., *Schreiter*, no. 3637 (TYPE, in Gray Herb.).

While from its habit and leaf-form this plant cannot be placed in any hitherto recognized species, further material from other stations and gathered at different seasons is needed before the distinctions may be felt satisfactory in a group so intricate. It is a pleasure to name this species for its discoverer, Dr. Rudolfo Schreiter, whose specimens have proved exceedingly useful in the study of Stevia and other difficult groups of the Argentine flora.

S. SEEMANNII Sch.-Bip. in Seem. Bot. Herald. 298 (1856). Of this Mexican species two varieties may be distinguished thus:—

Var. α. **typica**, involucri squamis purpureis et cum capillis tenuibus eglandulosis sparse ornatis; corollis atrosanguineis.—For range and exsiccatae see p. 136.

Var. β. **Selerorum**, var. nov., involucri squamis viridescentibus dense glandulari-puberulis; corollis ut videtur albis vel albidis.—MEXICO: between San Martin and Tlaxiasco, in the State of Oaxaca, *Caec. & Edw. Seler*, no. 1602 (TYPE, in Gray Herb.).

S. SELLOI (Spreng.) Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 209 (1876). *Kleinia Selloi* Spreng. Syst. iii. 438 (1826). *S. oxylaena* DC. Prod. v. 123 (1836). Of this species there appear to be at least two recognizable varieties. These may be characterized as follows.

Var. α. **typica**, foliis lanceolatis vel anguste oblongis plerisque 3–5 mm. latis; involucri squamis sparse adpresseque villosis et cum glandulis sphaericis sessilibus sparsis ornatis.—BRAZIL: Rio Grande do Sul, *Sello*, no. 1069 (Gr., BM.), *Herb. Imp. Bras.* no. 998 (Gen., Par., phot. Gr.). PARAGUAY: in the neighborhood of Caaguazú, *Hassler* no. 9098 (Gr., Brl., Univ. Gen.); in region of Carimbatay River, *Hassler*, no. 4568 (Gr.).

Of this variety the Paraguayan form has leaves slightly narrower, more distinctly punctate, and less inclined to rubescence than the Brazilian. It also has a more open panicle, but better and more mature material of the Brazilian form will be needful to show whether these minor differences have any classificatory value.

Var. β. **ypacarayensis**, var. nov., foliis linearibus plerisque 1–3 mm. latis; involucri squamis minute puberulis et cum glandulis sphaericis sessilibus ornatis sed non villosis.—PARAGUAY: on the plain, Cordillera de Altos, *Hassler*, no. 3910 (Gr., Brl.); in the region of Lake Ypacaray, *Hassler*, no. 12,154 (TYPE, in Gray Herb.).

S. SERRATA Cav. Ic. iv. 33, t. 355 (1797). Of this abundant, va-

riable and wide-ranging species several varieties are keyed on p. 121. Among these the following may be here placed on record as a novelty.

Var. **haplopappa**, var. nov., foliis oblongis obtusis vel rotundatis a media parte crenato-serratis basi cuneata integris; pappo saepissime solum coroniformi sed aliquando arista plerumque unica supplemento.—MEXICO: near the city of Durango, *Palmer* ('96) 750 (TYPE, in Gray Herb., isotype U.S.); near the city of Aguas Calientes, *Rose & Hay*, no. 7752 (Gr.).

An habitually awnless variety. When awned achenes occur they are usually solitary and are found in but few heads of the inflorescence. The variety thus forms in *S. serrata* a close parallel for var. *uniaristata* in *S. rhombifolia*.

S. TOMENTOSA HBK. Nov. Gen. et Spec. iv. 145, t. 352 (1820). Of this Mexican species an exaristate variety may be recognized as follows:

Var. **Seatonii**, var. nov., a var. *typica* (cum adelphocarpiis regulariter aristiferis) differt praecipue achaeniis omnibus exaristatis solum pappo coroniformi ornatis.—MEXICO: Maltrata, alt. 1680 m., *Seaton*, no. 487 (TYPE, in Gray Herb.).

S. YACONENSIS Hieron. in Engl. Bot. Jahrb. xxii. 724 (1897). To the already described varieties of this species there may be added:

Var. **saltensis** (Hieron.), comb. nov. *S. saltensis* Hieron. l. c. 725 (1897). This plant scarcely differs from the typical *S. yaconensis* except in having slightly larger heads (averaging about 12 mm. long) and in the presence of 2–3 awns (3–5 mm. in length) on each of the 3–4 adelphocarps. These differences, in the presence of close similarity in other respects, fail to yield satisfactory or convincing specific distinctions, especially as the variability of the pappus has been fully demonstrated in several related species of the genus.

Var. **aristifera**, var. nov., var. *typicae* similis sed differt involucri squamis incurvo-puberulis cum vel absque glandulis paucis sessilibus sed non glandulari-puberulis; pappo e squamis brevibus et apud adelphocarpia etiam 1–3 aristis atropurpureis sistente.—ARGENTINA: Jujuy: Dept. Tumbaya: Volcán, Abra de la Laguna, alt. 2500 m., *Schreiter*, no. 2685 (TYPE, in Gray Herb.). Dept. Humahuaca, *Venturi*, no. 8635 (Gr.), a specimen in secondary (merely rameal) foliage.

Eupatorium (§ **Conoclinium**) **Cabrerae**, spec. nov., herbaceum ascendens vel suberectum pilis albis vel primo purpureis brevibus attenuatis basi plus minusve incrassatis puberulum supra alterni-ramosum; caule pluri-costato scabrido viridi albo-medulloso, internodiis usque ad 7 cm. longis; foliis petiolatis lanceolatis caudato-

attenuatis argute dentatis basi acutis a basi 3-nervatis utrinque viridibus subconcoloribus supra subglabris vel sparse hirtellis subtus breviter pubescentibus 5–7.5 cm. longis 1.4–2 cm. latis media in parte caulis oppositis vel suboppositis supra plerisque alternis; petiolis 1–1.8 cm. longis gracilibus setuloso-puberulis; corymbis terminalibus densis convexis plerisque 3–5 cm. diametro; pedicellis 3–5 mm. longis; capitulis ca. 54-floris 9 mm. altis 8 mm. diametro; involucri subturbinato-campanulati squamis ca. 25 plerisque subaequalibus vix imbricatis subbiserialibus 4–5 mm. longis lanceolato-linearibus acutis dorso hirtellis apice saepe purpureis; receptaculo conico; corollis purpureis vel roseis glabris, tubo (inclusis faucibus vix differentiatis) ca. 3.5 mm. longo; dentibus limbi deltoideis; achaeniis gracilibus nigrescentibus 3–3.5 mm. longis glabris vel obsolete scabratis; pappi setis ca. 20 albis corollam subaequantibus.—ARGENTINA: on easily inundated flats of the Rio de la Plata within the limits of the Castells Estate between Buenos Aires and La Plata, Mar. 29, 1929, *A. L. Cabrera*, no. 757 (TYPE, in Gray Herb.). URUGUAY? "woods of Uruguay," *Tweedie*, no. 88 (Gr.).

This plant in habit and many of its characters approaches *E. Candolleanum* Hook. & Arn. and may well have been a component in the mixed material seen by Hooker and Arnott when publishing their species. However, it does not accord well with their description, which calls for a plant with opposite and crenate leaves while here they are (on the upper part of the stem) conspicuously alternate and sharply toothed. Furthermore, the phyllaries are said to be few-seriate in *E. Candolleanum*, but here they are scarcely more than uniseriate. It would seem that the material of *E. Candolleanum* which was retained by Hooker in his own herbarium, which was later deposited at Kew, may be safely taken as representing what the senior author had in mind when describing the species, and it has in fact essentially opposite leaves with more rounded teeth as well as a somewhat more imbricated involucre. Subsequent interpretation of *E. Candolleanum* appears to have been drawn chiefly, if not solely, from the Kew specimen and from seemingly identical material communicated by Hooker and Arnott to De Candolle, who (Prod. vii. 270) also describes the leaves as opposite. *E. Candolleanum*, as thus interpreted by De Candolle (followed much later by Grisebach, Baker, Klatt, Hieronymus and Arechavaleta) possesses hemispherical or subrotund 30–40-flowered heads with rather broadly campanulate involucre, corollas (about 2.5 mm. long) with a perceptibly differentiated throat, and achenes which are only 1.2–1.5 mm. long and very distinctly 5-ribbed. In *E. Cabrerae*, however, the involucre is rather

turbinate-campanulate. Its corollas are about 3.5 mm. long and are scarcely differentiated into throat and proper tube. Furthermore its rather obscurely ribbed achenes are relatively slender and no less than 3–3.5 mm. in length. From these distinctions and minor differences of pubescence, etc., it seems clear that the two plants are separate species. Even if the one here described formed a part of mixed material originally ascribed to their *E. Candolleanum* by Hooker and Arnott, it certainly was not the element chiefly described in the original character of the species and may therefore be appropriately segregated. It is a pleasure to name the new species for its collector, Mr. A. L. Cabrera, who is giving discriminating and scholarly attention to the *Compositae* of his country.

E. (§ **Subimbricata**) **Caeciliae**, spec. nov., lignosum fuscescente hispidulo-tomentellum; ramis oppositis subteretibus post exsiccationem longitudinaliter corrugatis glabratis atrobrunneis usque ad 4 mm. diametro; foliis oppositis oblongis serratis apice basique integris et acutatis pinnatim venosis firmiter membranaceis supra obscure hirtellis vel glabrescentibus post exsiccationem atrobrunnescentibus subtus paullo pallidioribus in costa nervisque sordide tomentellis 5–7 cm. longis 2.5–3 cm. latis impunctatis; petiolo fusco-tomentello tereti ca. 1 cm. longo; corymbis terminalibus subsessilibus folia vix superantibus multicapitulosis densis 8–9 cm. diametro valde convexis; pedicellis ca. 6 mm. longis puberulis; capitulis ca. 8-floris 11 mm. altis; involucri squamis subtriserialibus laxe imbricatis acutis vel etiam attenuatis; corollis verisimiliter albis glabris ca. 7 mm. longis; tubo proprio brevissimo vix ullo; faucibus gradatim ampliatis ca. 5 mm. longis; dentibus limbi anguste deltoideis; achaeniis gracilibus scabridis nigrescentibus ca. 4 mm. longis; pappi setis ca. 40 albidis inaequalibus sublaevibus, longioribus corollam subaequantibus.—"*Eupatorium* sect. *Eximbricatae* spec. forsan nova affinis *Eu. sordido* Less.," Loesener, Verh. Bot. Ver. Prov. Brand. lxv. 119 (1923).—GUATEMALA: mountain woods between Totonicapam and Los Encuentros, Departments Quezaltenango and Sololá, 25 Sept. 1896, *Caecilie and Eduard Seler*, no. 2361 (**TYPE, in Gray Herb.**)

On account of its unequal and subtriseriate phyllaries the writer would refer this plant to § *Subimbricata* rather than to the § *Eximbricata*, where placed by Loesener. Nor does it appear to be closely related to *E. sordidum* Less., a species with very numerously flowered heads and many other differences. Among the Central American species of § *Subimbricata* this approaches none very closely though it keys out to the vicinity of *E. silvicola* Robinson, from which however, it differs markedly in its oblong instead of ovate leaves, short petioles, dark pubescence and denser more corymbose inflorescence.

A species of this genus having been already dedicated to Prof. Seler, the name here applied commemorates the notable botanical explorations of Mrs. Caecilie Seler-Sachs, who accompanied her distinguished husband on his arduous archeological expeditions to tropical America and diligently collected plants of the regions visited.

E. (§ **Eximbricata**) **chaparense**, spec. nov., frutescens a basi curvata lignescenti paullo repenti erectum verisimiliter 1 m. altum; caule tereti purpureo-villoso pilis tenuibus attenuatis purpureo-nodulosis vestito; foliis oppositis sessilibus lanceolatis utroque attenuatis serratis sed ad basin versus integris 3-nervatis utrinque viridibus supra tenuiter puberulis subtus vix pallidioribus pubescentibus praecipue in nervis venisque laxe villosis et cum glandulis lucidis sessilibus copiose conspersis textura membranaceis plerisque 3–4 cm. longis 8–12 mm. latis; corymbo terminali oppositirameo composito foliaceobracteato planiusculo 5–15 cm. diametro; capitulis (vix maturis) breviter pedicellatis ca. 20-floris ca. 7 mm. altis; involucri anguste campanulati squamis ca. 13 subbiseriatim imbricatis oblongis vel oblongo-spatulatis et subaequalibus (extimis minoribus 2–3 lanceolatis acutis exceptis) ca. 4–6 mm. longis apice rotundatis dorso pubescentibus viridibus ad apicem versus tomentellis pallidioribus vel saepe purpurascentibus; corollis albis glabris; tubo proprio 1 mm. longo; faucibus cylindratis modice ampliatis 2 mm. longis; dentibus limbi deltoideis 0.4 mm. longis; achaeniis (immaturis) pallide brunneis subglabris 1.5 mm. longis; pappi setis ca. 30 albis sublaevibus 3 mm. longis.—BOLIVIA: Dept. Cochabamba: Prov. Chapare: bushy plain, Chusi near Incachaca, alt. 2300 m., Feb. 18, 1929, *Steinbach*, no. 9241 (TYPE, in Gray Herb.).

When keyed out by the author's revision of the Bolivian Eupatoriums this species falls in with *E. latipaniculatum*, a large-leaved plant with which it manifestly has no close affinity. In its blunt velvety-tipped phyllaries it recalls several Brazilian and Paraguayan species but as to foliage, number of florets, etc., differs clearly from each of these.

E. geranifolium × **odoratum.** Professor N. L. Britton has most kindly brought to the writer's attention what appears to be a natural hybrid between *E. geranifolium* Urb. and *E. odoratum* L. It was collected by Professor and Mrs. Britton in Porto Rico on a bank above Villalba, alt. 650 m., Dec. 8, 1929, no. 9356 (Gr.). The typical form of *E. geranifolium* they collected near Aibonito, Dec. 6, and typical *E. odoratum* at Quebradellas and Monteflores. The former of these species has deeply trifid leaves with segments which are again incisely but rather bluntly lobed. In *E. odoratum* on the other hand the leaves

are rhombic-ovate, undivided, and somewhat sharply and coarsely serrate-dentate. No. 9356 presents, as to its foliage, a striking and rather precise intermediate between these markedly different types. Its leaves, while much more deeply and obtusely toothed than in *E. odoratum*, are somewhat longer, relatively narrower, and much less deeply trifid than in *E. geranifolium*. The involucral scales are rather similar to those of *E. geranifolium* but are less numerous and disposed in fewer ranks and (at least the inner) somewhat more acute, in all these respects approaching the form in *E. odoratum*. The pedicels likewise have intermediate length. In these and some minor features the plant presents so accurately what might be expected were *E. geranifolium* to cross with *E. odoratum* that such parentage seems highly probable. Well marked natural hybrids in the genus *Eupatorium* are in the writer's experience of pretty rare occurrence. The present instance is noteworthy by reason of the striking dissimilarity in the leaf-forms of the parents.

E. (§ **Cylindrocephala**) **Haughtii**, spec. nov., ut videtur herbaceum perenne vel suffrutescens oppositirameum primo aspectu glabrum sed enimvero minute incurvo-puberulum; caule (saltim parte superiori) et ramis hexagonis post exsiccationem costatis; foliis oppositis breviter petiolatis ovatis vel lanceolato-ovatis utroque acutis argute serratis pallide viridibus fere concoloribus a basi 3-nervatis utrinque in nervis venisque puberulis textura firmiter membranaceis persistentibus et marcescentibus 3.5–5 cm. longis 1.2–2 cm. latis; capitulis ca. 40-floris 13–14 mm. longis in cymas laxas plerumque trifidas et saepius iterum et iterum furcatas dispositis; involucri elongati ellipsoideo-cylindrati squamis 40–50 pluriseriatim imbricatis laevibus apice rotundatis dorso pulcherrime viridi- et albi-striatis, extimis ovatis ca. 1.8 mm. longis et 0.8 mm. latis, intermediis maximis anguste obovato-oblongis 9 mm. longis et 2 mm. latis, intimis oblanceolato-linearibus subacutis 10.5 mm. longis et 0.8 mm. latis; axe involucri post delapsum squamarum obovoideo-subclavato 3.2 mm. longo 1.7 mm. crasso; receptaculo modice convexo; corollis graciliter tubulatis ca. 5 mm. longis ut videtur albis; styli ramis caeruleo-violaceis; achaeniis gracilibus atrobrunneis 4.5 mm. longis in angulis minute scabratis; pappi setis ca. 27 albis 5.5 mm. longis.—PERU: Dept. Piura: Pariñas Valley, July 7, 1929, *Oscar Haught*, no. 275 (TYPE, in Gray Herb.).

In some respects resembling *E. cripsimum* Robinson, but to be readily distinguished by its angled stem and branches, its larger and much more coarsely toothed leaves, eciliate green and white instead of stramineous phyllaries, etc.

E. IODOTRICHUM Robinson, Proc. Am. Acad. lv. 19 (1919). This Ecuadorian species of § *Eximbricata* characterized by its rather small but petiolate coarsely toothed and deeply cordate leaves of firmly membranaceous texture proves to have two readily distinguishable forms, namely:

Forma **typicum**, caule in parte superiori et petiolis et pedicellis et involucri squamis cum pilis brevibus patentibus violaceis glanduloso-capitatis dense instructis nec non cum pilis brevibus saepe incurvis ornatis.—Vicinity of Cañar, *J. N. & G. Rose*, no. 22,766 (Gr., U. S., N. Y.).

Forma **Rivetii**, forma nova, a f. *typica* differt capillis omnibus tenuibus incurvis ecapitatis.—ECUADOR: in the region of Quito "pl. herbacée, fl. blanche; Terme Nord, Nov. 1902, *M. Rivet*, no. 282" (Par., phot. and fragm. Gr.).

E. LAETE-VIRENS Hook. & Arn. Comp. Bot. Mag. i. 240 (Mar. 1836). As in many parallel cases, Baker in the Flora Brasiliensis has unfortunately involved the nomenclature of this species in some confusion by reducing it to a variety of the later published *E. steviaefolium* DC. (Sep. 1836). Manifestly the course has to be reversed under the International Rules and in fact under any rules which take a proper account of priority. It is manifestly under *E. laete-virens* Hook. & Arn. and not under *E. steviaefolium* DC. that the highly variable forms of this specific group should be assembled. The following disposition of these may therefore prove of service.

Var. α. **typicum**, foliis lineari-lanceolatis acutis inciso-serratis, pellucide reticulatis.—*E. laete-virens* Hook. & Arn. sensu strictiori.

Var. β. **angustius** (DC.), comb. nov., foliis lineari-lanceolatis subintegris membranaceis pellucide reticulatis.—*E. steviaefolium* β. *angustius* DC. Prod. v. 158 (Sep. 1836).

Var. γ. **steviaefolium** (DC.), comb. nov., foliis lanceolatis vel lanceolato-oblongis vel ovato-lanceolatis crenato-serratis membranaceis subtus laxe pubescentibus.—*E. steviaefolium* DC. l. c.

Var. δ. **itatiaiae** (Glaziou), comb. nov., foliis rhombeo-ovatis membranaceis paucidentatis subtus laxe pubescentibus.—*E. steviaefolium* var. *itatiaiae* Glaziou, Bull. Soc. Bot. Fr. lvi. mém. 3, 386 (1909), as a nomen subnudum.

Var. ε. **hypopocum**, var. nov., foliis ovato-lanceolatis subcoriaceis crenato-serratis subtus dense canescenteque tomentellis.—*E. steviaefolium* Bak. in Mart. Fl. Bras. vi. pt. 2, 318, 319 (1876) in small part, namely as to plant of Burchell (no. 4743), not precisely of DC.—BRAZIL: Sant' Anna, State of São Paulo, 4 May, 1913, *A. Brade*, no. 5946 (TYPE, in Gray Herb.); without precise locality, *Burchell*, no. 4743 (Gr.).

Of the two remaining varieties referred by Baker to *E. steviaefolium*, namely Var. *erigeroides* (DC.) Bak. and Var. *rosmarinifolium* (Sch.-Bip.) Bak. (as *rosmarinifolia*), neither is likely to prove truly conspecific. *E. erigeroides* DC. seems to be merely a slightly later name for the plant described by Hooker & Arnott as *E. Tweedieanum*. It differs from *E. laete-virens* Hook. & Arn. in having decidedly petiolate leaves and a somewhat more southern and western range. *E. rosmarinifolium* Sch.-Bip. was applied to a plant with essentially linear subentire leaves of thicker nature, firmer texture and strongly involute margins. In floral structure both of these plants are certainly close to *E. laete-virens* Hook. & Arn., but until intergradation can be clearly demonstrated they seem better treated as separate species, namely as *E. Tweedicanum* Hook. & Arn. and *E. rosmarinifolium* Sch.-Bip.

E. (§ **Subimbricata**) **Lilloi**, spec. nov., fruticosum 1–3 m. altum; ramis primo hexagonis pallide ochraceo-tomentellis tardius subteretibus glabrescentibus cortice griseo obtectis; internodiis plerisque 2–6 cm. longis; foliis oppositis petiolatis ovato-oblongis utroque acuminatis serrato-dentatis penniveniis supra sparse hirtellis viridibus subtus paullo pallidioribus reticulato-venulosis in nervis venisque molliter pubescentibus vel subtomentosis 14–17 cm. longis 6–11 cm. latis firme membranaceis; petiolo tomentello supra canaliculato 1–2 cm. longo; corymbo terminali hemisphaerico oppositirameo 5–10 cm. diametro; capitulis ca. 12-floris breviter pedicellatis ca. 6 mm. longis; involucri campanulato-subcylindrici ca. 3-seriatim imbricati squamis ca. 14 ovato- vel lanceolato-oblongis acutis, exterioribus extus puberulis, interioribus glabriusculis apice paullo recurvatis; corollis albis vel pallide violaceis gracilibus ca. 2.5 mm. longis cylindratis glabris; dentibus limbi brevissimis; styli ramis filiformibus; achaeniis ca. 1.7 mm. longis juventate stramineis maturitate pallide griseis in angulis et ad summam partem versus paullo hispidulo-puberulis; pappi setis ca. 20 stramineis corollam subaequantibus.—ARGENTINA: Salta: Rosario de la Frontera, alt. 900 m., in bushy places, Mar. 26, 1905, *Lillo*, no. 4408 (TYPE, in Gray Herb.); Aguazay, Orán, alt. 600 m., Feb. 15, 1925, *Schreiter*, no. 3654 (Gr.); San Bernardino, alt. 1200 m., Mar. 18, 1927, *Schreiter*, no. 5268 (Gr.). Tucumán: Capital, Barranca Colcoada, alt. 550 m., Feb. 15, 1926, *Venturi*, no. 4092 (Mo.).

This species was first taken by the writer for the Brazilian *E. orgyale* DC., to which in habit and foliage it bears a considerable resemblance. However, closer study has made clear that the Argentine plant is certainly a distinct species. Its young branches are tomentellous instead of merely puberulous, the leaves are more pubescent and are not as in the Brazilian plant disposed to nigrescence in

drying, the heads are more slender, the phyllaries narrower, more hairy, sharper-pointed, and more inclined to be squarrose at the tip. In the Brazilian plant the achenes are slightly larger and nearly or quite glabrous.

It is a pleasure to name this species for Professor Miguel Lillo, who first collected it and who first inferred its probable novelty.

The sheet in the Prodromus Herbarium representing DeCandolle's *E. orgyale* bears unfortunately mixed material. The specimen to which is attached the label of Blanchet's no. 1923, mentioned in the original diagnosis, is wholly at variance with DeCandolle's description for it has deltoid-ovate 3-nerved leaves rounded or subcordate at base instead of the ovate-lanceolate pinnately nerved leaves cuneate at base called for by the diagnosis. On the same sheet is a very poor specimen from Rio de Janeiro presumably collected by Lund. This seems to have furnished most of the characters set down by DeCandolle and may be regarded as the type. DeCandolle seems to have been in error in stating that the heads were sessile and 6-flowered. At all events, in authentic material of *E. duodecimiflorum* Sch.-Bip., which appears to represent the Lund element in *E. orgyale* and to correspond with the essentials of its original diagnosis, the heads are about 12-flowered and are shortly but clearly pedicellate.

E. LONGIPETIOLATUM Sch.-Bip. ex Rusby, Mem. Torr. Bot. Club, iii. no. 3, 52 (1893); Robinson, Contrib. Gray Herb. lxi. 65 (1920). This species, hitherto known only from Bolivia where collected in the vicinity of Mt. Sorata and in some localities in the Province of Yungas, may now be reported from Peru in which it was collected by Prof. C. H. T. Townsend, Sep. 7, 1911 at the side of the river in Huancabamba, alt., 4200 ft., nos. A174 and A175 (both in Field Mus.). In reply to inquiry Prof. Townsend tells me that: "The Huancabamba in question is in northern Peru and almost directly east of Piura town, a little east of Ayabaca. It is east of the higher or western Cordillera, in the valley of the Huancabamba river and near its head."

E. (§ **Eximbricata**) **Mancoanum**, spec. nov., fruticulosum perenne decumbens vel procumbens; caulibus solitariis vel pluribus flexuosis dense ramosis sed maturitate basin versus aliquando nudatis a cortice suberoso scabro-rugoso pallido griseo tectis 2–5 dm. longis; ramis gracillimis numerosis curvato-adscendentibus glanduloso-puberulis ad apicem versus foliosis ad basin versus saepissime denudatis nodulosis; internodiis saepe perbrevibus plerisque 2–5 mm. longis sed aliis ad apices ramorum versus usque ad 1–2 cm. longis; foliis anguste lanceolatis vel oblongis 7–16 mm. longis 3–5 mm. latis serratis obtusis basi breviter cuneatis juventate brevissime puberulis maturitate sub-

glabris a basi obscure 3-nervatis punctatis saepe caducis; petiolo 1–2 mm. longo; corymbis terminalibus 2–3(–5)-capitulatis; pedicellis filiformibus 1–2 cm. longis; capitulis ca. 30-floris 9 mm. altis 7 mm. diametro; involucri campanulati squamis ca. 13 subaequalibus oblongis vel anguste obovatis apice rotundatis ciliolatis dorso griseopuberulis obscure 3-nervatis ca. 5.5 mm. longis et 2 mm. latis; corollis ut dicitur albis, tubo proprio gracili 1.3 mm. longo; faucibus distincte ampliatis ca. 1.5 mm. longis; dentibus limbi 0.8 mm. longis; achaeniis nigris ad basin versus attenuatis in angulis ciliolatis ca. 3 mm. longis; pappi setis ca. 24 vix 2 mm. longis albis scabratis attenuatis.—PERU: Department of Cusco: bushy banks below Colquipata, alt. 3300–3500 m., May 1, 1925, *Francis W. Pennell*, no. 13,767 (TYPE, Field Mus., ISOTYPE Gr.); also on open rock-ledges on paramo of Cerro de Cusilluyoc, between Pancartambo and Tres Cruces, alt. 3300–3500 m., May 2–6, 1925, *Pennell*, no. 14,167 (Field Mus., fragm. Gr.).

The latter specimen, though having wider, flatter and somewhat smoother leaves than those shown in the type, seems pretty certainly conspecific and probably presents a mere state of development due to a better supply of moisture.

In a genus of hundreds of species where most of the appropriate descriptive names and many of the more intelligible and euphonious geographic adjectives have long since been exhausted, one may be permitted some fanciful association in the selection of names. The present species may thus recall the Inca demigod *Manco Capac* from whom according to Inca mythology their race first learned the mysteries of agriculture.

The species may be appropriately placed near *E. piurae* Robinson, from which, however, it differs in its fewer-flowered heads, much looser inflorescence, narrower and smoother leaves, shorter pappus, etc.

E. MULTIFIDUM DC. Prod. v. 182 (1836). In the Flora Brasiliensis (vi. pt. 2, 330) Baker reduced this species without comment or explanation to the simultaneously published *E. anethifolium* DC. l. c. As Baker does not cite the type of either of these species and mentions only the plants of Sello and of Riedel, it appears probable that he never saw really authentic material, but was misled by earlier identifications made by Schultz-Bipontinus, who seems to have inferred the specific identity of the two and labelled as *E. anethifolium* specimens which differ conspicuously from that species but agree closely with *E. multifidum*. When in Geneva in 1905 the writer examined and photographed the single stem of *E. multifidum* in the Prodromus Herbarium, but it was not until a recent visit to the Museum of

Natural History at Paris that he had opportunity to study both these species and to confirm the differences originally noted by DeCandolle. There can be no doubt that the species are closely related, but as shown by the type sheets they are readily distinguishable. Indeed they differ rather conspicuously and should certainly not be treated as identical. It is quite possible that future collections may show intergradation, but thus far nothing of the sort is suggested by any material seen by the writer. Until evidence of transition can be shown it seems best to treat the species as independent, the chief differences being as follows:

E. ANETHIFOLIUM DC. Scarcely lignescent, essentially glabrous; leaves 4–5 cm. long, rather flaccid, their linear-filiform segments somewhat pinnately disposed; petiole often 2 cm. long; heads distinctly pedicelled and the inflorescence in consequence relatively loose; phyllaries only slightly if at all fringed.—BRAZIL: State of Rio Grande do Sul, *Imperial Herbarium of Brazil*, nos. 913 and 912 (this probably was the number cited by DeCandolle through clerical error as 929), both in the Museum of Natural History, Paris (phots. Gr.).

E. MULTIFIDUM DC. Fruticulose, distinctly though sparsely setose-hispid and very shortly glandular-puberulent; leaves subsessile, small, mostly less than 2 cm. long, stiffish in texture, the segments flabellately disposed, linear to narrowly oblong; heads sessile or nearly so, densely glomerate; phyllaries of two sorts, the outer linear-subulate, the inner oblong, shorter and toward the summit densely and conspicuously fringed with short white hairs.—BRAZIL: Minas Geraës: Morro Cavado, near Serra Negra, *Glaziou*, no. 7714 (Copenh., small fragm. Gr.); São Paulo: *Imperial Herbarium of Brazil*, nos. 508 and 509 (both in Mus. Nat. Hist. Par., phots. Gr.), an unnumbered specimen of the same collection (Gen., phot. Gr.); Parana: Capão Grande, Fortaleza, in swampy places, alt. 850 m., *Dusén*, no. 2904 (Gr.), Desvio Ribas, on the plains, *Dusén*, no. 9472 (Gr.), Pinhaes, on the plains, *Dusén*, no. 14,509 (Gr.); without locality: *Sello*, no. 5186 (Gr.); *Riedel*, no. 724 (Gr.).

E. POLYCEPHALUM Sch.-Bip. Though this name, which was taken up by the writer, Contrib. Gray Herb. lxxvii. 30 (1926), was there used in strict accord with an isotype authenticated by Schultz, it was then mistakenly considered identical with *E. bracteatum* Gardn. and now needs further definition. Schultz never published this species and its name first appeared in print in Baker's synonymy of *E. bracteatum* Gardn., Fl. Bras. vi. pt. 2, 338 (1876). In 1926 the writer from the information then available saw no reason to question Baker's merging of these plants which have considerable habital similarity.

However, subsequent opportunitites to study specimens of Gardner's *E. bracteatum* of Pernambuco have made it clear that it should be recognized as a species quite distinct from the type-material of the more southern *E. polycephalum* Sch.-Bip. as shown by Riedel's no. 2962 (1300), collected on the plains of Minas Geraës, a specimen (now in Gray Herb.) so labelled in the characteristic hand of Schultz and duly marked by him "n. sp." In the latter plant the indument is very closely pannose and of an almost silvery lustre. The leaves are alternate on the main axis and only subopposite on the branches. They are spatulate-oblanceolate, rounded at the apex and subentire or obscurely crenate toward the tip. Furthermore, they are clearly pinnate-veined and not obviously reticulated. In *E. bracteatum* Gardner, as shown by Gardner's 2900 examined both at the British Museum and at the Botanical Conservatory in Geneva, the indument is less closely matted. The leaves are almost uniformly opposite both on the primary and secondary axes. They are ovate or obovate (with cuneate base) rather than spatulate and are provided with rather numerous short spreading deltoid teeth. Beneath they are closely and obviously reticulated and somewhat 3-nerved from a point well above the base. It should be stated that Baker, l. c., both in his description and in the accompanying plate has confused these plants and mingled their characters. Though no constant differences have thus far been detected in their inflorescences it seems pretty clear that they are distinct species. The silvery alternate-leaved plant of Minas Geraës may continue to bear the name *E. polycephalum* Sch.-Bip. while the duller opposite-leaved *E. bracteatum* Gardn. of Pernambuco, being invalidated by an earlier homonym, may be appropriately renamed as follows:

E. pernambucense, nom. nov. *E. bracteatum* Gardn. in Lond. Jour. Bot. v. 472 (1846), not Hook. & Arn.

E. SIMILLIMUM Robinson, Contrib. Gray Herb. lxxvii. 38 (1926). Hitherto known only from Paraguay this shrub or small tree may now be recorded from Bolivia as follows: Dept. Santa Cruz, Prov. Sara, in thickets of Buenavista, alt. 450 m., *Steinbach*, no. 6647 (Gr.). Mr. Steinbach reports that the species attains a height of 4 m., is called añilero, and yields from a concoction of its leaves a sky-blue dye. His field notes further indicate that the inflorescence is a cinnamon-green, the flowers a greenish gray and the style-branches roseate. It may be recalled that the species is a close relative of, though quite distinct from, *E. laeve* DC., a well known dye plant of Brazil.

E. (§ **Subimbricata**) **tacaquirense** (Hieron.), comb. nov. *Helogyne tacaquirensis* Hieron. in Engl. Bot. Jahrb. xl. 369 (1908); Mattf.

in Fedde, Rep. Spec. Nov. xix. 79 (1923). *Eupatorium dejectum* Robinson, Contrib. Gray Herb. lxxvii. 12 (1926), lxxx. 18 (1928).

When some years ago characterizing *Eupatorium dejectum* the writer saw no reason to question its generic position. Its partly opposite leaves, 3-nerved leafblades, somewhat funnel-shaped corollas, and merely barbellate rather than actually plumose pappus were features which prevented any thought of the genus *Helogyne* and the previous description of the plant in that group was at the time overlooked only to be recently discovered. On reviewing and once more testing the available distinction between *Helogyne* and the vast and polymorphous genus *Eupatorium* the writer finds that the former, if it is to be maintained as a separate group, will probably have to be restricted to a few Andean species of xerophytic habit with very small alternate leaves, small few-flowered heads and narrowly tubular corollas. In the past some emphasis has been laid on the enlarged style-branches and the plumose pappus, but these characters prove too vague and variable within the little group itself to furnish distinctions for its recognition. The present note is prompted by no wish to express opinion on the ultimate validity of *Helogyne* but is designed merely to record the specific identity of *Eupatorium dejectum* with the earlier *Helogyne tacaquirensis* and to re-establish the species under the correct name in the genus where it seems to belong.

E. (§ **Subimbricata**) **tucumanense** Lillo & Robinson, spec. nov., fruticosum 2–2.5 m. altum; caule subtereti erecto breviter fulvescenterque tomentello; medulla alba; foliis oppositis ovatis caudato-acuminatis argute serrato-dentatis basi integris rotundatis deinde in petiolum longum cuneatim alatum gradatim angustatis supra praesertim in nervis pubescentibus subtus saltim in nervis fulvescenter tomentellis membranaceis utrinque reticulato-venulosis; venulis pellucidis; lamina (parte petioliformi exclusa) 12–15 cm. longa 4–7 cm. lata; dentibus plerisque 1–2 mm. altis 4–10 mm. inter se distantibus; parte petioliformi 3–5 cm. longa; corymbo terminali composito densiusculo foliaceo-bracteato 1–2 dm. diametro planiusculo vel modice convexo; capitulis ca. 70-floris 11 mm. altis 12 mm. diametro; involucri campanulati squamis subtriseriatim imbricatis, extimis oblongis vel oblanceolatis 5–8(–13) mm. longis 2–4 mm. latis herbaceis tomentellis apice saepe subsquarrosis, intermediis substramineis anguste oblongis acutis ciliatis ca. 7–8 mm. longis, intimis linearibus acutis ciliatis 8–9 mm. longis 0.6–1 mm. latis; corollis albis vel roseo-lilaceis tubulatis sursum paullo ampliatis sed sine faucibus distinctis; dentibus limbi hispidulis; achaeniis sparse patenter villulosis basi conspicue callosis; pappi setis ca. 25 albis brevissime barbellato-scabratis.—ARGENTINA:

Prov. Tucumán: Quebrada de San Rafael, *Castillon*, nos. 2958 (Gr.) and 3639 (Gr.); Cumbre de San Janvier, *Castillon*, no. 3640 (Gr.); Quebrada de Lules, alt. 500 m., *Schreiter*, nos. 2322 (Gr.), 4037 (Gr.) and 4091 (TYPE, Gr.); *Venturi*, no. 1173 (Gr.); Puerta S. Javier, alt. 900 m., among pines, *Venturi*, no. 2586 (Mo.).

In habit and foliage this species closely resembles the Bolivian *E. triosteifolium* Rusby but it has a somewhat different involucre, for its phyllaries are by no means so regularly graded. In fact, the outermost are nearly always more than half as long as the inner and sometimes (as in *Venturi*, no. 1173) become foliaceous and actually exceed them. In *E. triosteifolium*, however, the phyllaries are evenly graduated, the outermost being very short and ovate, scarcely a quarter the length of the inner. In *E. tucumanense* the stem is nearly cylindrical. In *E. triosteifolium* it is when young decidedly hexagonal. The leaves in *E. triosteifolium* are somewhat more oblong-ovate and tend more to pinnate venation, being broadest not much below the middle of the blade, while in *E. tucumanense* they are more decidedly ovate, broadest much below the middle, and tend strongly to be pinnate-nerved from near the base, rather than pinnate-veined. The heads in *E. tucumanense* are somewhat more numerously flowered. As yet the plant is known only from the Province of Tucumán.

E. (§ SUBIMBRICATA) URUBAMBENSE var. **mantarense**, var. nov., a var. *typico* differt inflorescentiis paullo laxioribus subfastigiatim corymbosis; pedicellis gracilibus; involucri squamis post exsiccationem stramineis nec coloratis; capitulis ca. 9-floris paullo minoribus.—PERU: Dept. Huancabamba: Prov. Tayacaja: in the Mantaro Valley, near La Mejorada, alt. 2800–2900 m., corolla and stigmas blue, Mar. 1926, *Dr. A. Weberbauer*, no. 7614 (TYPE, Field Mus., ISOTYPE Gray Herb.). While readily distinguishable by the traits stated, this plant in most of its features so closely corresponds to *E. urubambense* as to suggest that intergradation will probably be found as the intermediate territory becomes better known. The plant is therefore treated as a variety rather than an independent species.

Mikania (§ **Thyrsigerae**) **cochabambana**, spec. nov., paullo lignescens laxe sed alte scandens; caule subtereti post exsiccationem multicostato-subangulato brunnescenti-tomentello albo-medulloso usque in inflorescentiam folioso; internodiis (superioribus) ca. 5 cm. longis; foliis oppositis breviter petiolatis anguste ovatis attenuato-acutis remote obscureque undulato-serratis vel subintegris basi rotundatis supra atroviridibus villulosis (pilis brevibus tenuibus adpressis brunnescentibus) subtus pallidioribus dense subsericeo-tomentosis (pilis tenuibus adpressis pallidis vel in nervis venisque brunneis); lamina ca.

10 cm. longa et 4 cm. lata membranacea paullo supra basin pinnatim 5-nervata; petiolo tereti supra sulcato ca. 12 mm. longo brunneo-tomentoso; panicula terminali composita oppositiramea ovoidea foliaceo-bracteata; partialibus pyramido-ovatis 5–10 cm. longis; ramulis pedicellisque gracilibus saepius patentibus vel etiam deflexis saepe flexuosis; capitulis bene pedicellatis ca. 6.5 mm. longis; involucri squamis oblongis apice rotundatis vel subacutis dorso puberulis ca. 4 mm. longis et 1.7 mm. latis; corollis ut videtur albis glabris; tubo proprio gracili 1 mm. longo; faucibus turbinatis ca. 2 mm. longis; limbi dentibus deltoideis ca. 0.8–1 mm. longis; achaeniis maturis nigrescentibus gracilibus 2.5 mm. longis in parte superiori obscure hispidulis; pappi setis ca. 33 primo laete albis mox obscuris 4 mm. longis sublaevibus.—BOLIVIA: Dept. Cochabamba: Prov. Chapare: borders of woodland, Quebrada de Corani, alt. 1800 m., June 22, 1929, *Steinbach*, no. 9878 (TYPE, in Gray Herb.).

Among the previously described Mikanias of Bolivia this approaches perhaps most nearly to *M. Rusbyi* Robinson, which, however has larger heads, hispid tips to the corolla-teeth, longer achenes, etc. It has been impossible to place the present plant in any of the species known from other countries, those which approach it in foliage and habit having larger heads or differing in some good technical characters.

Mikania (§ **Globosae**) **comarapensis**, spec. nov., scandens modice gracilis verisimiliter plus minusve ad basin versus lignescens; caulibus flexuosis teretibus 3 mm. diametro vel crassioribus dense fulvido-pubescentibus (pilis patentibus vel deflexis) post exsiccationem multicostulatis; internodiis usque ad 14 cm. vel ultra longitudine; foliis oppositis graciliter petiolatis ovatis integris vel plerumque mucronulato-serrulatis caudato-acuminatis basi (apud folia caulina) profunde (sinu angusto acuto) cordatis 8–12 cm. longis 4.5–7.5 cm. latis membranaceis utrinque viridibus cum pilis gracilibus flavido-brunnescentibus subappressis villosis subtus paullo pallidioribus laxe exserto-reticulatis paullo supra basin pinnatim 5-nervatis; petiolo 4–5.5 cm. longo fulvido-tomentello; foliis rameis minoribus basi (saepe aliquid obliquis) subcordatis vel rotundatis; paniculis ramos breves terminantibus 4–16 cm. longis 2.5–6 cm. diametro pyramidatis; capitulis ca. 5 mm. longis sessilibus in glomerulos subsphaericos ca. 1.2 cm. diametro arcte aggregatis; involucri squamis lanceolato-oblongis obtusis vel apice rotundatis dorso villulosis; corollis ut videtur albidis; tubo proprio gracili 1.5 mm. longo cum glandulis globularibus sessilibus sparse instructo; faucibus ampliatis 1 mm. longis glabris; dentibus limbi deltoideis 0.2–0.3 mm. longis; achaeniis glabris 1.5 mm. longis;

pappi setis ca. 30 albis sublaevibus ad apicem versus distincte clavellatis corollam longitudine aequantibus.—BOLIVIA: Department of Santa Cruz: Yungas de San Mateo, Comarapa, alt. 2800 m., 25 Oct. 1925, *José Steinbach*, no. 8545 (TYPE, in Gray Herb.).

This plant, belonging by its inflorescence to § *Globosae*, differs clearly from the only other known Bolivian species of this section, namely *M. desmocephala* Robinson and *M. Williamsii* Robinson, in the deeply cordate base of the cauline leaves, villous leaf-surfaces, villulose phyllaries and details of leaf-venation and texture. All efforts to place the plant in any species of Brazil, Argentina or Peru have also failed. As received at the Gray Herbarium the type-material of this species (Steinbach's no. 8545) was entwined with a *Dioscorea*-like plant with some habital similarity but readily separable by its alternate leaves.

M. LECHLERI Sch.-Bip. Bonplandia, iv. 54 (1856), without diagnosis. When revising the Mikanias of Peru some years ago the writer had seen no material of this named but even yet undescribed plant. Subsequent opportunity to examine an isotype in the herbarium of the Royal Gardens at Kew has shown it unlike any Peruvian *Mikania* hitherto recognized. Nor has it been possible to place the plant satisfactorily in any Ecuadorian, Brazilian or Bolivian species. Under these circumstances it certainly should be given proper status by description. It should be observed that the following characters have been derived from the Kew material which, as the source of the first published description, automatically becomes the type.

M. (§ **Thyrsigerae**) **Lechleri** Sch.-Bip. in herb., fruticosa ramosa volubilis; caulibus usque ad 5 mm. diametro brunnescentibus juventate puberulis tardius glabratis fistulosis; internodiis usque ad 7 cm. vel ultra longitudine; foliis caulinis oppositis graciliter petiolatis deltoideo-ovatis acuminatis basi patenter cordatis divaricatim hastatim 5-lobatis vel -angulatis margine aliter subintegris revolutis subcoriaceis utrinque viridibus et praesertim in nervis venisque puberulis a basi 3(–5)-nervatis 8–10 cm. longis et latis; petiolis flexuosis ca. 4 cm. longis, eis ejusdem jugi ab annulo transverso basi conjunctis; foliis rameis minoribus ovatis basi rotundatis vel abrupte subcuneatis; paniculis compositis pyramidatis oppositirameis foliaceo-bracteatis; partialibus 6–14 cm. longis 5–10 cm. diametro; capitulis (infeliciter valde immaturis) prope apices ramulorum subaggregatis subsessilibus; involucri squamis anguste oblongis obtusis dorso puberulis ca. 3 mm. longis 0.8–1 mm. latis; corollae tubo proprio gracili ca. 1.7 mm. longo; faucibus distincte ampliatis ca. 1.5 mm. longis; dentibus limbi lanceolato-deltoideis; pappi setis carneis.—PERU: Dept. Puno: Prov.

Carabaya: "inter virgult. St. Gavan, Aug. '54," *Lechler*, no. 2480 (TYPE, K., phot. Gr.). From the brief data given, it is clear that this plant was collected on the eastern slopes of the Cordilleras north of Lake Titicaca probably near the River San Gavan, therefore in the upper drainage of the great river Madre de Dios. Among the Peruvian species of *Mikania*, *M. Lechleri* with its strongly angled leaves keys out in the group with *M. angularis*, *M. laxa* and *M. punctata*, but differs from all these in its much smaller subsessile heads.

M. (§ **Corymbosae**) **stygia**, spec. nov., verisimiliter alte scandens et paullo lignescens aspectu primo glaberrima sed obscure puberula post exsiccationem nigerrima lucidula; caulibus teretibus usque ad 8 mm. vel ultra diametro fistulosis costulatis; internodiis usque ad 17 cm. vel ultra longitudine; foliis oppositis petiolatis oblongis paullo undulato-dentatis vel integris caudato-acuminatis sed apice vero rotundatis basi rotundatis vel brevissime acutatis chartaceis opacis paullo supra basin 3-nervatis 11–16 cm. longis 5–7 cm. latis; petiolis 2.5–4 cm. longis, eis ejusdem jugi a linea transversa puberula conjunctis; appendicibus stipulaceis nullis; foliis rameis minoribus plerisque 5–8 cm. longis; corymbis compositis valde convexis vel etiam ovoideis 5–12 cm. diametro; capitulis in glomerulos aggregatis et sessilibus et breviter pedicellatis ca. 13 mm. longis a bracteis ellipticis ca. 5 mm. longis suffultis; involucri squamis oblongis ca. 8 mm. longis apice rotundatis puberulisque; corollis gracilibus; tubo proprio et faucibus paullo gradatim ampliatis ca. 6.5 mm. longis; dentibus limbi angustis sublinearibus recurvis ca. 2 mm. longis vix 0.6 mm. latis; achaeniis 4 mm. longis gracilibus paullo scabratis; pappi setis ca. 45 albis corollam subaequantibus brevissime barbellatis capillaribus non clavellatis.—BOLIVIA: Dept. La Paz: region of Mapiri, alt. 850 m., 12 May 1927, *Dr. Otto Buchtien*, no. 1874 (TYPE, in Gray Herb.).

In character this species does not approach closely any previously described Bolivian *Mikania*. The unusual name selected for the species alludes of course to the remarkable nigrescence of the plant in drying. According to Dr. Buchtien this is a constant trait.

OBSERVATIONS ON THE GENUS STEVIA.

Stevia is a group of baffling difficulty. Its taxonomy, perplexing almost from the start, has for many decades been exceedingly involved. The genus has never had clear revision and, as species and varieties have been multiplied, reference material for the group, even in the best organized herbaria both of Europe and America, has tended to sink

into almost hopeless confusion as a result of cumulative uncertainty regarding specific identities.

Some seven or eight years ago, when the writer took up the study of the genus with a view to its revision, morphological features were encountered which rendered progress exceedingly slow. These were the result of a curious and still problematic heterocarpy for which there seems no close parallel elsewhere in the *Compositae*.

Overlooked or but slightly noticed by early writers on the genus, this diversity in the achenes of the same head was observed by Schultz-Bipontinus and recorded in some detail for the extra-tropical South American species by Hieronymus. However, its classificatory significance has remained far from clear. To evaluate the taxonomic importance of this phenomenon of heterocarpy in *Stevia* it has been necessary to dissect many hundreds of heads, a process more than usually tedious since in each case every achene had to be examined and sketched or otherwise recorded individually.

Before an attempt is made to summarize the results of this study it will be desirable to review in its broader outlines the taxonomic history and distribution of the group, and to recall briefly its general morphology.

Taxonomic History.

Stevia, though a genus of considerable size—its proposed species running to more than three hundred—was unaccountably late in coming to botanical attention. Not one of its forms, though many are abundant and showy in nature, seems to have been known to Linnaeus or his immediate successors. Lamarck was apparently the first to put on record any members of the group, describing in his Encyclopedia (1786) two of its species, one founded on a Uruguayan plant of Commerson, the other on a Peruvian collected by Dombey. As both of these happened to be multiaristate, Lamarck not unnaturally placed them in *Eupatorium*.

The genus *Stevia* was launched by Cavanilles in 1797. He based it upon three plants which had been raised in the Royal Gardens at Madrid from seeds or stock brought from Mexico. As to the identity of these species, all of which were well described and clearly figured, there can be no question. The first two, namely *S. salicifolia* and *S. serrata*, are in full accord with the present interpretation of the genus, while the third, *S. pedata*, is with equal certainty the plant now called *Florestina pedata* (Cav.) Cass. Thus, it will be observed, not only the majority of the original species but those first in sequence confirm the present interpretation of the genus. Furthermore, it was with *Eupa-*

torium and *Ageratum* that Cavanilles compared his new genus and we may accordingly infer that it was the eupatorioid element that he had specially in mind rather than the third species, which being helenioid was remote in its affinities. Accordingly the publication of *Stevia*, even though based on mixed material, can be regarded as generically definite.

Cavanilles subsequently added but one species to *Stevia*, namely *S. hyssopifolia*. This, however, was antedated as to its specific name by *Ageratum punctatum* Ort. = *S. punctata* (Ort.) Pers. (apparently inseparable from *S. serrata* Cav.).

The next to contribute to the classification of *Stevia* was Willdenow, who published briefly upon the genus at three times. First, in his Species Plantarum, iii. 1774–6 (1804), he merely redescribed *S. salicifolia*, *S. serrata* and *S. pedata* of Cavanilles and transferred to the genus *Stevia* two earlier species, making thus the combinations *S. linearis*, founded on *Ageratum lineare* Cav., now known as *Palafoxia linearis* (Cav.) Lag., and *S. Eupatoria*, based on *Mustelia Eupatoria* Spreng., which is certainly a true *Stevia* and seems to have fair claim to validity. Three years later (Mag. Ges. Naturf. Fr. Berl. i. 137) Willdenow described from material cultivated in the Botanic Garden at Berlin a species of his own, namely *S. ivaefolia*. This is probably best treated as a variety of *S. serrata* Cav., since it differs from that species in no important character, though its leaves are somewhat broader and, as in most cultivated material, its inflorescence has become unnaturally loose.

Finally in 1809 Willdenow (Enum. Hort. Berol. 854–6) redescribed the Stevias grown in the Berlin Garden and added two, namely *S. purpurea* and *S. ovata*. The former of these cannot be satisfactorily distinguished from *S. punctata* (Ort.) Pers. (= *S. serrata* Cav.) and its name in any event would not hold since it is antedated by the valid homonym *S. purpurea* Pers.

As to *S. ovata* the case is more perplexing. This species, or one bearing the same name and having essentially the same characters, appears to have originated with Lagasca, according to whom the name was first employed in the "Elenchus" for the year 1805 of the Royal Garden at Madrid. In the Index Kewensis the species is entered as follows: "S. ovata *Lag. Elench. Hort. Matr.* (1805); *ex ej. Gen. et Sp. Nov. 27.*"

Nothing further is known of this "Elenchus" of the Madrid Garden for 1805. It was probably a manuscript list or as its name suggests an index or alphabetic catalogue of the plants grown in the Garden at that date. At all events no such printed publication seems to have

been seen by DeCandolle, Pritzel, Pfeiffer, or Schultz-Bipontinus. Nor could any such paper be found by the compilers of the Royal Society Catalogue or by those of the Index Kewensis. Finally, what is even more convincing, no publication of this name and date is mentioned in Colmeiro's scholarly and exceedingly detailed work called La Botánica y Los Botánicos de la Peninsula Hispano-Lusitana, where on pages 100–1 there is a special account of such publications as have dealt with the plants cultivated in the public gardens of Spain and Portugal. To judge from this careful enumeration of just such papers, no "Elenchus" for the Madrid Garden appeared between 1803 and 1816. This is by no means surprising. Cavanilles had died and Ortega had retired. Furthermore the country was in an impoverished and disturbed state on account of the Napoleonic wars.

Though by his own statement *Stevia ovata* originated with Lagasca about 1805 and though it has pretty consistently been treated as his species by such subsequent authors as Sprengel, Reichenbach, DeCandolle, Steudel, Schultz-Bipontinus, Hemsley, Hooker and Jackson, there unfortunately appears to be no nomenclatorial basis for such procedure. Lagasca's earliest publication of his *S. ovata* seems to have taken place in 1816. His statement at the time that he had been using the name since 1805 cannot be taken as invalidating Willdenow's *S. ovata*, duly named and described in 1809.

Most of the material of *Stevia* in European gardens in the last years of the 18th century and the first decade of the 19th seems pretty clearly to have been the result of exchange with the Royal Garden of Madrid, where the genus was first described and where it was for several years cultivated in some variety from Mexican seeds sent by Sessé. It seems likely, therefore, that Willdenow's *S. ovata* came directly or indirectly from the same source. It is quite possible, however, that he was merely giving botanical description to a plant horticulturally current as *S. ovata*, the name under which it was originally grown at Madrid. However this may have been, Willdenow made no mention of Lagasca and in no way implied that the name *S. ovata* could be traced to any earlier use.

Even more perplexing is another fact in this connection. When in 1816 Lagasca at length described the species, which by his own account he had grown and named as early as 1805, he follows almost verbatim the diagnosis given by Willdenow in 1809 though he makes no mention of that author.

This treatment of *Stevia* by Lagasca in 1816 (Gen. et Spec. Pl. Nov. 26–28) is one of considerable importance. Not only did it about treble the number of species attributed to the genus but it introduced some

obscurities which have never been satisfactorily cleared. These species of Lagasca's have in fact constituted one of the major difficulties of the genus and merit special review. Fourteen of them were of Mexican origin and three were supposed to have come from South America. The latter may be considered first. All three were collected by Neé, two being attributed to Peru and the third to Chile. In regard to the last, *S. adenophora*, it may be said from description to be very unlike any now known Chilean species of the genus. On the other hand its characters, so far as mentioned in Lagasca's description, correspond suspiciously with those of *S. elatior* HBK. of Mexico and Colombia, except that the corolla is said to have been purple, while in *S. elatior* its conspicuous and spreading limb is white or merely roseate. From similarity of described character Sprengel reduced *S. elatior* to *S. adenophora*, but Schultz-Bipontinus, whose knowledge of *Stevia* was much more detailed, restored *S. elatior* to validity, evidently hesitating to replace a name so widely used and so securely based on an extant type by one resting solely on a brief and not wholly applicable description of material alleged to have come from a different hemisphere. In the interests of practical classification it seems wise to accept the decision of Schultz.

S. suboctoaristata, said to come from Peru, is a mere *nomen subnudum* quite unrecognizable from its two-line description stating solely that it was very similar in habit to the Mexican *S. paniculata* but had a 7–9-awned pappus. The only attempt to revive the name *S. suboctoaristata* for material of later collection appears to be Schultz's use of it in determining Mandon's no. 243 from the Sorata region in Bolivia. This weak move toward its validation cannot be taken very seriously for Mandon's plants were so carelessly sorted that no less than three distinct Stevias were sent out under this particular number, no one of them showing any close resemblance to *S. paniculata*, the Mexican species with which *S. suboctoaristata* was specially compared by its author.

Lagasca's other species said to have come from Peru, namely *S. coriacea*, is more fully described but has never been rediscovered; that is to say no *Stevia* material subsequently collected in Peru has fully agreed with Lagasca's diagnosis.

As to Lagasca'a fourteen Mexican species the case is somewhat different. At all events their geographic source is subject to much less doubt. So far as stated they were raised in the Royal Gardens at Madrid from seeds (communicated by Sessé) of plants collected by Neé in southern central Mexico chiefly about Guanajuato, Pachuca, and Guadalupe. Of the fourteen about half can be identified with a

fair degree of certainty. These include the annual and more delicate species on the one hand and the more robust pronouncedly shrubby species on the other. It is the intermediate group of perennial herbs, particularly *S. pubescens*, *S. lanceolata*, *S. purpurea*, *S. suavcolens*, *S. paniculata*, *S. ovata*, and *S. enarthotricha*, which have caused special difficulty and threatened all definiteness and stability in the classification of the group.

In the first place it is to be noted that all of these species were originally described from garden plants, doubtless in some degree altered by cultivation. Thought to have horticultural promise, they were rather widely distributed to European gardens between 1795 and 1820, notably to those of Paris, Berlin, Copenhagen, Carlsruhe, and Vienna. In these they were often grown together, considerably confused as to labelling, and perhaps hybridized. As a result most of the larger European herbaria contain many specimens of these early horticultural Stevias. Curiously enough they all look somewhat alike, a fact noticed by Schultz. They tend to have smoother, larger, and slightly more carneous leaves, as well as looser inflorescences, than can ordinarily be matched in the nearest approaches to be found among the very numerous specimens now available from natural Mexican habitats.

Of these species *S. purpurea* was antedated by the earlier homonym of Persoon; *S. incanescens* was too inadequately described for recognition; *S. lancolata* was probably a mere form of the variable *S. serrata* Cav.; and *S. enarthotrica* (notwithstanding its acute leaves) may best be rated as a probable synonym of *S. elatior*.

S. suavcolens, *S. paniculata* and *S. ovata* of Lagasca are known to the writer only from their original descriptions to some extent substantiated by early garden material and the rather careful illustrations of Reichenbach (Icon. Exot.) founded upon such horticultural specimens. After prolonged effort it has been impossible either to show conclusively that these are separable entities or confidently to identify them with any species now known from the wild.

It will be remembered that *S. ovata* had already been described by Willdenow in 1809 and that, except for trifling emendation, Lagasca repeated Willdenow's diagnosis, a fact clearly indicating that the plant intended was the same. Willdenow's *S. ovata* accordingly becomes the earliest name for any species of this perplexing and presumably conspecific group.

As yet neither the writer nor, so far as he knows, anyone else specially interested in *Stevia* has found it possible to visit Madrid and search for types in the extensive and valuable but as yet not very fully or-

ganized collections at that center. Success in such an enterprise would seem more promising had the plants in question been described from particular dried specimens collected in the wild. Drawn as they were largely if not entirely from living material in the Garden, it is much less likely that they could be, after more than a century, convincingly associated with extant types.

The next step, and a very notable one, in the records of *Stevia* was the publication in 1820 of the fourth volume of the Nova Genera et Species by Humboldt, Bonpland and Kunth. In this well known work no less than 22 species of *Stevia* were described in scholarly detail. Of these only three were associated with synonymy or previous records and 19 put forth as novelties, of which 15 were from Mexico, 3 from Colombia, and 1 from Ecuador. Several of these supposed novelties drop at once, from character or on nomenclatorial grounds, into synonymy. Thus *S. hyssopifolia* HBK. (in character scarcely separable from *S. viscida* HBK.) and *S. pubescens* HBK. have earlier homonyms, described by Cavanilles and by Lagasca respectively. *S. microphylla* HBK. rests on a type which appears to be a stunted and damaged *S. trifida* Lag. *S. virgata* HBK. is quite inseparable from the earlier and somewhat variable *S. serrata* Cav. *S. glutinosa* and *S. fastigiata* HBK. are certainly mere forms of the species which has been traditionally (and with probable correctness) standing for the earlier *S. lucida* Lag.

In this connection it may be noted that Kunth, when he prepared the manuscript of the Nova Genera et Species Plantarum, was evidently familiar with the work of Cavanilles and of Willdenow, but made no mention of the for *Stevia* much more extended and important work of Lagasca, which he would pretty certainly have done had he been aware of its existence, for he was in several cases describing plants from the very same localities, as for instance Guanajuato, Pachuca, and Guadelupe. Under these circumstances some duplication in these two works is quite to be expected.

For the most part these species, collected by Humboldt and Bonpland and described by Kunth, are pretty readily interpreted. They rest upon extant types, which if often fragmentary are at least natural specimens and not those of plants artificially modified by cultivation. Of course, subsequent exploration has shown transition between and consequent merging of some of these plants which Kunth took to be separate entities. Thus *S. quitensis* HBK. now seems only a pappus-form of the widespread and somewhat variable *S. rhombifolia* HBK. Similarly *S. ternifolia* HBK. appears to be only a somewhat casual ternate-leaved form of the same (normally opposite-leaved) species.

After all this elimination, there still remain about ten of these "HBK" Stevias which prove valid and furnish helpful landmarks in the perplexing classification of this genus, though even among this number *S. jorullensis* has until recently remained obscure and a fully convincing rediscovery of *S. elongata* and *S. origanoides* in nature has not occurred even yet, though more than 125 years have passed since the classical explorations of Humboldt and Bonpland.

Cassini and Lessing, well known specialists on the *Compositae*, rather unaccountably seem to have devoted scarcely any attention to *Stevia*. Hooker and Arnott in working up South American collections of Gillies and Tweedie touched incidentally upon the genus, putting forth early in 1836 eight new species from southern Brazil and the Argentine Republic, most of which remain valid today. Later in the same year DeCandolle in the fifth volume of his Prodromus brought together the Stevias known to him. These ran to no less than 68 species.

This treatment of DeCandolle had the merit of bringing to attention toward a dozen previously unrecorded South American Stevias, chiefly from Brazil. It had also some unfortunate defects. Its descriptions were brief and often furnished little effective contrast. Several of them were based on very scrappy types, a kind of material to which their author seemed disposed at times to devote an overconscientious attention.

DeCandolle of course knew of the previous work of Kunth and briefly compiled his descriptions; but here, as elsewhere, he gives no evidence of actual study of Kunth's types. These were presumably accessible in Paris at the time, and the reason for this omission is not clear. While in Geneva in the summer of 1927 the writer was most kindly permitted by Professor Briquet and Mr. Cavillier to examine the correspondence of Kunth with DeCandolle as it is still preserved at the Botanical Conservatory. It is of small extent but gives ample evidence of mutual esteem, though of slight personal acquaintance.

Lacking this familiarity with Kunth's types DeCandolle in putting out no less than seventeen supposed novelties, believed to have come from Mexico, naturally recharacterized in several instances plants already covered by the descriptions of Kunth. A further defect in the work of DeCandolle and one which it is still impossible to clear up arose from his readiness to base species on material of doubtful geographic origin. Thus he characterized four species of multiaristate Stevias (*S. Haenkeana, S. hispidula, S. divaricata* and *S. vigintiseta*) as presumably from Mexico. Even after the lapse of nearly a century not one of these has been rediscovered and in no instance has a multi-

aristate *Stevia* been demonstrated from north of Panama. Indeed the group is characteristically of the southern hemisphere, barely reaching equatorial regions in Ecuador. Under these circumstances it seems highly probable that DeCandolle's types of these species, collected by Neé, Haenke, and Karvinski and at the time communicated from the herbarium of von Martius, who was particularly engaged in South American studies, really came from South America. This is by no means the only case in which the collections of Neé and Haenke have given evidence of confusion as to their geographic labelling.

Toward the end of his multiaristate series DeCandolle described two species, namely his *S. rapunculoides* and *S. calycina*, both of which by imbricated involucres and other traits are clearly species of *Eupatorium*. This is one of surprisingly few instances in which plants have been ascribed to the genus *Stevia* which belong elsewhere. *Stevia* as a whole is exceptionally well defined. Its difficulties are internal and not those of delimitation.

The only keyed revision of *Stevia* which has ever reached print was published in 1853 by Schultz-Bipontinus (Linnaea xxv. 268–292). This paper, which is in Latin and at points none too lucid, is largely made up of incidental comments, diagnoses of supposed novelties, discussion of synonymy, and general observations, the whole being, so to speak, shot through by a running key of some complexity. Though he seems to have begun with courage, he evidently lost heart as he proceeded. After enumerating 22 species of what may be called *Eustevia*, that is to say the exaristate and pauciaristate members of the genus, he trails off into mere mention and excessively abbreviated synonymy on reaching the multiaristate series. His nomenclature was also a bit arbitrary. However, with all its peculiarities this paper has been a suggestive and useful one. It constitutes one of the few attempts made by Schultz to give monographic expression to his prolonged and diffuse study of the *Compositae*.

Grisebach in 1874 (Goett. Abh. xix. 164–6) and 1879 (Symb. 167–8) added a half dozen species to *Stevia* chiefly based on collections made in northern Argentina and southern Bolivia by Lorentz and Hieronymus.

Baker in 1876, contributing the *Compositae* to the Flora Brasiliensis, keyed and gave rather detailed descriptions of 28 species of *Stevia* from Brazil, Uruguay and portions of the Argentine Republic.

Hemsley in 1881 (Biol. Cent.-Am. Bot. ii. 84–90) enumerated no less than 73 species of *Stevia* as having been recorded from Mexico and Central America.

By far the most careful and detailed work on the Stevias, especially

on those of the southern hemisphere, was done by Hieronymus (Engl. Bot. Jahrb. xxii. 708–741, xxviii. 560–564, and xl. 356–368, papers ranging from 1897 to 1908). He happily brought to bear upon the subject an extensive field acquaintance with the group. He was well aware of the heterocarpic tendencies and fully understood the importance of studying and recording all the achenes in the head. He had exceptional facilities for interpreting the prior work of Grisebach. He was conscientious in giving full descriptions and many measurements.

In the course of his work on Stevias he characterized fifty new species and toward a score of new varieties. Notwithstanding all the painstaking care with which his work was done, his proposed species and varieties have remained rather obscure. They were neither keyed nor illustrated. They were in some cases drawn so close together as to permit little if any variation in nature without obliterating their supposed distinctions. The very length and fulness of his descriptions have at times rendered them difficult to compare and interpret, for he seems to have been more anxious to record individual specimens than to indicate the differential traits of specific entities. As a result his species and varieties have been little understood by botanists resident in South America.

Subsequent to Hieronymus the most notable contribution to the knowledge of *Stevia* has been that of Hassler, who (in Fedde's Rep. Spec. Nov. xi. 165–167) put on record four admirably distinct Paraguayan species.

Such in brief has been the important literature of the genus. Of course, the group has been incidentally touched upon by many other writers, as for instance, Persoon, Sprengel, Hooker, Schlechtendal, Schrader, Walpers, Bentham, Philippi, Bertolini, Klatt, Rusby, Chodat, Greenman, R. E. Fries, Perkins, and Blake, who have contributed one or more species each.

Distribution.

Stevia, as thus far known, is an American genus. Not only is it restricted to the New World but, unlike the related genera *Ageratum*, *Eupatorium*, and *Mikania*, it is confined to the American Continent, being unknown from the Antilles or any of the other Caribbean Islands.

It extends from the southwestern borders of the United States through the cordilleran countries to northern Chile. It is abundant in the Argentine Republic, apparently attaining its highest southern latitude in the southeastern parts of that country. There are few species in Uruguay. In Paraguay the genus is much better developed

and shows a high endemism. In southern and central Brazil it is pretty well represented and by species which are for the most part endemic to that country. The genus is sparingly represented in Venezuela, chiefly from the mountains about Caracas and near Merida. It is as yet unknown from any of the Guianas.

As to abundance and variety the exaristate and pauciaristate series reach an evident maximum in Mexico. The multiaristate series on the other hand becomes in Paraguay not only the dominant but the exclusive manifestation of the genus. In the Argentine Republic and in adjacent parts of Bolivia there is found, together with a fair representation of other types, a group of nearly related species in which the pappus consists of short scales with 2–3 unequal tooth-like awnlets, which exceed the scales but are much shorter than the corolla.

General Features.

As *Mikania* differs from *Eupatorium* very constantly in having 4-flowered heads in which the florets are each subtended by a phyllary of the 4-scaled uniseriate involucre, so *Stevia* can be readily distinguished from *Ageratum* by its 5-flowered heads and uniseriate 5-scaled involucre.

The number of florets in *Stevia* may well have a bit of explanation, since on more than one occasion it has been incorrectly stated in ways which have proved decidedly misleading. Thus DeCandolle gave botanists a problem when he recorded in his *S. triflora* an alleged 3-flowered *Stevia* from Mexico. Repeated efforts were made to recognize this species in the great quantities of Mexican material which became available in the larger herbaria between 1890 and 1905 but quite without success. The more the genus was studied the clearer it became that the heads were normally 5-flowered. It is true, in a single species, namely the Mexican *S. simulans* Robinson, 7-flowered heads are the rule and in two Brazilian species (*S. origanoides* Gardn. and *S. hypericifolia* Hieron.) 4-flowered heads are prevalent at least in some individuals, but elsewhere throughout the genus they are so uniformly 5-flowered as to make the occasional occurrence of a 4-flowered or a 6-flowered head suggest the casual type of variation illustrated by the 5-parted lily or a "four-leaved" clover.

During search for variation and limits in this matter of flower-number in the heads of many species of *Stevia*, it quickly became evident that there was a possible source of error in the fact that the florets of a single head are often by no means simultaneous in their development, three or four being frequently precocious and the others tardy in their appearance above the closely enveloping involucre.

Inferring, therefore, that DeCandolle might have been misled in this way, the writer when last at Geneva obtained permission to dissect a head from the type of *S. triflora* and, sure enough, besides the three well developed florets there were minute buds of two others, which would presumably have matured somewhat later. The plant does not differ essentially from *S. rhombifolia* var. *stephanocoma* Sch.-Bip.

The heads of *Stevia* being thus nearly uniform in the number of their florets are far more similar in size and form than is the case in most other large genera of the *Compositae*. Consequently no subgeneric or sectional subdivision is feasible upon such characters. Still more awkward for purposes of classification is the essential uniformity of the involucre throughout the genus. In most Composite genera its form and imbrication, the relative length of its inner and outer phyllaries, their shape, texture, nervation, ciliation, color and appendages are prolific sources of group-distinctions. Almost nothing of the sort is here possible. The involucre instead of varying as in *Eupatorium* from campanulate to ovoid or at times to long-cylindric remains in *Stevia* almost uniformly cylindric. Its phyllaries, if we neglect the usually much reduced outermost bractlet or two at the base, are closely similar in size and shape. They tend in general to be narrowly oblong or lance-linear and are usually acute or acutish. They are herbaceous to subscarious in texture. For the most part they are erect and little imbricated. Occasionally they curve gently outward at the tip, but they are never really squarrose.

The disk is small, naked, and flat or nearly so. It is never strongly alveolate or pubescent.

The corollas throughout the genus are of very similar form. The proper tube, if distinguishable from the throat, is mostly short. The throat is cylindric or trumpet-shaped. The teeth are relatively short and at maturity spreading. They are equal except in two or three of the annual species of Mexico, notably *S. Aschenborniana* Sch.-Bip., in which the limb is decidedly bilabiate, the three outer teeth being enlarged and spreading, while the two inner are much smaller and suberect.

The achenes vary from short-cylindric or -prismatic to rather slenderly so. They are most often 5-nerved and 5-angled. Some of the multiaristate species of South America have achenes with six to nine or even ten nerves, but the actual number becomes obscure owing to the occurrence of partially developed intermediate nerves or because of variation within the species or even within the same head. At all events the numbers of these achenial nerves in *Stevia* have not been found clear or trustworthy differential characters.

Of floral characters there remains the pappus. Curiously enough this is as fluctuating and polymorphous in *Stevia* as the other floral structures are stable and uniform. Its manifold tendencies will be discussed under the heterocarpy of the genus.

As *Stevia* is so poor in involucral or floral features of diagnostic significance it becomes necessary to base distinctions and keys in the group very largely on habit, form and openness of inflorescence, and arrangement of the leaves, as well as on their shape, texture, color, punctation, etc. The presence or absence of a petiole becomes a distinction of some utility in group-classification, but offers difficulty in the matter of terminology. Throughout the genus, in those species having stalked leaves, the petioles frequently become winged toward the summit, the wing merging imperceptibly into the blade. Usage has differed in reference to these winged petioles. By several writers, who have dealt with the genus, they have been regarded as a contracted part of the blade and leaves so borne have been spoken of as sessile. This is apt, however, to be misleading since the leaves are after all very evidently stalked. Of course this abruptly contracted then gradually cuneate proximal portion of the leaf-blade may be indicated by some descriptive phrase, such as "cuneately winged petiole" or "contracted petioliform base of the blade," such phrases being modified to fit circumstances. As the structure ranges all the way from a slender petiole only slightly winged near the summit to a very much broader affair but little differentiated from the blade proper, it cannot be satisfactorily covered by any single term.

Pubescence, here as elsewhere, offers some distinctions which can be readily observed and easily described. These, in *Stevia*, are the more tempting as other differential traits are scarce. Of course pubescence-characters are often delusive and if trusted far may lure classification into trifling and artificial subdivisions. However, in *Stevia* one distinction, though recurrent in quite different parts of the genus and often of a trivial nature, becomes in certain cases a rather valuable differential. It is found in the pubescence on the dorsal surface of the phyllaries (and usually upon the pedicels and branchlets of the inflorescence as well). On the one hand this pubescence may consist of short straight stiffish gland-tipped hairs, which leave the surface at right angles. On the other hand the hairs are slender, jointed, attenuate, glandless and either subappressed or more often incurved or crisped. Interspersed among the hairs in this second type of pubescence are usually some scattered sessile globular glands, at first lucid, at length dull yellowish-brown.

So frequently do these two forms of phyllary-pubescence occur in

plants otherwise alike that in general they can have no more than formal or at most varietal value. However, there are certain points in the genus where the distinction seems to become valuable and take on permanence along specific lines. It then becomes too useful to be neglected.

In duration and general habit Stevias range from annuals (few in number and of Mexican and Central American occurrence) to perennial herbs, suffruticose plants, or true shrubs. They do not seem to become arborescent or to take on in any part of the genus a twining or liana habit. Nor are they ever armed. They are plants chiefly of mountain ravines, open woodlands, stream banks, bushy or exposed hillsides. A few become decidedly xerophytic and occur on dry plains and on barren ledges.

Economic Aspects.

For a group of its extent *Stevia* has exceedingly little claim to economic importance. When introduced to cultivation in Europe about 1795 several of the herbaceous perennial species were thought to have horticultural promise and were accordingly rather widely distributed by seed exchanges. For four or five decades these species seem to have been grown in many European gardens and they were somewhat frequently mentioned and occasionally illustrated in horticultural literature of the period.

These cultivated species were at no time numerous and their cultivation fell off rapidly after the middle of the 19th century. In 1866 Vilmorin (Fl. Pl. Terre, ed. 2) mentions but three. It is true, Nicholson (Dict. Gard.) a decade or so later describes ten (exclusive of synonyms) but it seems pretty clear that he was merely compiling most of them from literature of much earlier date, as for instance from notes accompanying the publication of plates in the Botanical Magazine and the Botanical Register. When Bailey prepared the second edition of his very detailed Cyclopedia of Horticulture, he could find no evidence that any true Stevias were being grown in America, and in recent years the genus has almost ceased to appear in the seedlists of even the largest botanical gardens.

This disappearance of true *Stevia* from horticulture can be partially explained by the wide popularity of the so-called stevias of the nurserymen and cut-flower trade, namely various forms of *Piqueria trinervia* Cav., a plant of very easy growth and open graceful inflorescence.

S. cardiaca Perkins from a little known mountainous region in southern Bolivia is reported by Bender, its discoverer, to be valued by the natives as a cardiac remedy.

S. Rebaudiana (Bertoni) Hemsl., the "Sweet Herb of Paraguay" has been the subject of study and experimentation at several places in the hope of extracting for use in food-stuffs the substance, said to be entirely wholesome, which gives its leaves a very extraordinary saccharine-like taste. The plant is still receiving some attention, at least to the extent of being experimentally grown at agricultural stations. Its problems seem to be for the chemist rather than the botanist.

S. trifida Lag., a Mexican species, according to a field note of Langlassé, is employed in the form of an infusion of its roots and flowers against dysentery.

Heterocarpy.

Though *Stevia* is undoubtedly a natural group, being more than ordinarily constant in most of its floral characters, its pappus shows a diversity quite unparalleled in any other genus of the *Compositae*. It appears sometimes as a low entire, erose or toothed rim, sometimes as a series of 3–5 deltoid or ovate, oblong or elliptic scales, which may be quite distinct or almost wholly connate into a cup. These may be supplemented or at times entirely replaced by 2–3 short and unequal teeth or rudimentary awns, or by 1–5 slender and much more elongated awns equalling or even exceeding the corolla, or by 6–30 awns or firm bristles. Occasionally it takes the form of short bristles or very narrow scales. Finally, in certain achenes, it may disappear altogether.

In fully a third of the species there is a fairly pronounced heterocarpy, the pappus of different achenes in the same head manifesting marked dissimilarity. Thus the head, rather than the individual achene, becomes the unit by which the pappus-characters must be judged.

Prolonged efforts to devise a system by which these many forms of pappus, complicated by heterocarpy, may for descriptive purposes be brought within definite types have met with but moderate success. However, the subject permits some generalization which it is hoped may prove of interest.

Heterocarpy in the *Compositae* is a rather frequent phenomenon. However, it is apt to be correlated with difference in the position of the achenes. Its most common manifestation takes the form of unlikeness between the achenes of the disk-flowers and those of the ray-flowers, the differences being those of shape, size, fertility, pappus, pubescence, and other appendages. In some genera there is perceptible difference between the inner disk achenes and the outer ones, even where there are no ray-flowers.

Thus, elsewhere in the *Compositae*, heterocarpy where it occurs can be pretty readily associated with differences of position, exposure or function. Here in *Stevia*, however, it is highly exceptional since it singles out certain individual achenes in what appears to be a coördinate group. For there are no ray-flowers in *Stevia* and therefore no distinction is possible between the achenes of disk- and ray-flower. Furthermore, the five florets in the *Stevia*-head are all marginal and consequently no difference of exposure is evident.

Though the florets in a *Stevia*-head thus seem coördinate it is probable that they—or to be more precise their subtending phyllaries—do not form a true whorl but are the members in the last two revolutions of a morphological spiral with the theoretical interval of two-fifths.

Where heterocarpy in *Stevia* becomes definite it nearly always manifests itself in the following way. Four of the achenes in each head, which from their coördinate origin and likeness of form we may for convenience of mention term the *adelphocarps*, remain closely similar while the fifth achene, which from its peculiarity of form we may call the *idiocarp*, exhibits several readily perceptible differences. The most conspicuous of these result from the simplification, marked reduction, or obsolescence of the pappus.

Even in the isocarpic species of *Stevia* no less than five types of pappus are to be distinguished. Four of these types are found to have heterocarpic equivalents. Finally four more categories of much less definite character have to be assumed to cover some of the rarer and transitional forms. These thirteen types, or as we may better say, pappus-habits of *Stevia* may be described as follows.

Type I. Pappus alike in all the achenes, awnless, consisting of 3–5 scales, which are about equal in height and which may be quite distinct and in form deltoid, ovate, oblong or elliptic, being usually erose or toothed, or may be in varying degrees connate into a toothed or subentire rim, cup, or even a short cylindric tube. (Pl. I. f. I.)

Type II. Heads definitely heterocarpic. Pappus of the four adelphocarps as in Type I. Pappus of the idiocarp obsolete or entirely lacking. (Pl. I. f. II.)

Type III. Pappus alike or nearly so in all the achenes, consisting of mostly 3–5 distinct or in varying degree connate scales together with an equal number of slender awns, the latter about equalling or rarely exceeding the corollas. (Pl. I. f. III.)

Type IV. Distinctly heterocarpic. Pappus of the adelphocarps as in Type III. That of the idiocarp reduced to scales only. (Pl. I. f. IV.)

Type V. Pappus similar in all the achenes, consisting of a few minute scales together with 1–3 which are of somewhat greater length

but scarcely more than a quarter or a third the length of the corollas. These slightly longer scales are usually unequal, tooth-like, and of slightly firmer texture than the smaller scales. They may well be interpreted as the somewhat dilated bases of obsolescent awns and in fact they sometimes taper into awn form and become somewhat longer. (Pl. I. f. V.)

Type VI. The corresponding heterocarpic condition in which the adelphocarps have a pappus closely as in Type V. but the idiocarp has little or no pappus. (Pl. I. f. VI.)

Type VII. Pappus similar in all the achenes, consisting of rather numerous minute unequal terete or subterete awnlets. (Pl. I. f. VII.)

Type VIII. Achenes alike, each bearing (6–)10–30 awns about equalling the corollas. These awns may be subterete or toward the base slightly dilated. Sometimes these are accompanied by a few short and obscure scales. (Pl. I. f. VIII.)

Type IX. The heterocarpic equivalent of the preceding. The four aelphocarps bearing pappus as in Type VIII but the idiocarp bearing a much reduced pappus which may consist of a much smaller number of awns usually accompanied by short scales, or may be of several to many very short awns, or may be made up of scales only, or may be entirely lacking. (Pl. I. f. IX.)

Type X. Heterocarpy is here present, but instead of being definite and abrupt as in Type IV. it comes about by gradual transition, so that it becomes impossible to distinguish sharply between the adelphocarps and an idiocarp. Here the pappus consists of 1–5 awns accompanied by scales often united into a collar or cup. (Pl. I. f. X.)

Type XI. Heterocarpy is here again present but of a reversed and exceptional nature in which most of the achenes are merely scale-bearing but one or two have an awn or two as well. (Pl. I. f. XI.)

Type XII. This is clearly a modification of Type V. and differs from it merely in the fact that the tooth-like awn-bases present in Type V are here at least in some instances elongated into fully developed more bristle-like awns nearly or quite as long as the corollas. (Pl. I. f. XII.)

Type XIII. This is the heterocarpic manifestation of the preceding in which four achenes have a pappus similar to that in Type XII. but the fifth is a clearly marked idiocarp with scarcely a trace of pappus. (Pl. I. f. XIII.)

Of course, if minor differences were taken into account the number of these pappus-types could be considerably extended. It is believed, however, that the types here presented show all the main tendencies of the genus. They are not put forth as absolute or mutually exclusive

categories. Some intergradation between them undoubtedly occurs. Nevertheless, it has been found possible to classify upward of 95 per cent of the pappus-forms noted during some years' study of the genus in one or another of the types here described and illustrated.

Many questions present themselves. What do these highly diverse yet frequently recurring forms mean? What is the use to the plant of this strange heterocarpy? Why is an idiocarp sometimes present and sometimes not? What possible biological significance can this specialized achene have with its reduced pappus? Has it other differences of form, markings, time of development, or degree of fertility? Is the heterocarpy here a new trait, an advancing tendency, or a survival? Finally how is all this polymorphy in the pappus of *Stevia* related to group-development and consequently to classification?

Little can be contributed toward the solution of most of these questions, but the last takes on such taxonomic significance as to require careful attention before any intelligent attempt can be made to bring the classification of the genus into better order.

In consequence of the prevailing dearth of other characters in *Stevia*, special efforts have been made to try out these pappus-distinctions. Without exception, when these have been carried forward consistently they have led to patently unnatural results, as for instance the reference of conspecific material to different subgenera or sections. It is equally clear, however, that these pappus-forms or tendencies or habits are at times associated with and therefore indicative of natural groups (often of distinct range) and that they thus become taxonomic indices too valuable to be wholly neglected. Some further scrutiny of the pappus-types above enumerated will tend to make this matter clearer.

Some of these types, namely I, III, IV, V, VIII, and IX, are abundantly recurrent in nature, being represented by several to many species each. These types may therefore be taken as the regular and normal tendencies of the genus. Types II, VI, and VII on the other hand are rare and types X, XI, XII, and XIII are not only unusual but are less constant than the other types. In several ways they suggest transitional categories, made up of occasional intermediates between the other far stronger groups.

Thus, Type X, with a gradual transition from adelphocarp to idiocarp may well express the result of intergradation between Type III (with no idiocarp) and Type IV (with sharply differentiated idiocarp).

Types I and III stand in special relation to each other. That is to say transition from one to the other appears very easy and often occurs within the limits of single species. Type I may therefore be

regarded as an exaristate form or state of Type III. Between these two, Type XI forms a convincing intermediate.

Analogy would suggest that Types II and IV would be similarly related and pass readily from one to the other, but this does not seem to be the case. In fact Type II is an exceedingly rare phenomenon in *Stevia* and when Type IV loses its awns it passes, so to speak, through Types X and XI and reaches Type I. This is beautifully shown by the common and widely distributed *S. rhombifolia* HBK. Its typical form has pappus of Type IV. The Ecuadorian *S. Benthamiana* Hieron. appears to be certainly conspecific but shows a pappus in which as in Type X there is some gradual reduction in the number of the awns, instead of a single drop to an awnless idiocarp. A further step in the reduction is illustrated by the Mexican *S. uniaristata* DC., which is clearly a mere phase of *S. rhombifolia* with pappus of Type XI. Finally *S. compacta* Benth., having pappus closely of Type I, is certainly an awnless expression of the same species. Thus in this instance a species of Type IV on the gradual and complete loss of its awns passes not to Type II but to Type I.

Type XII is a mere modification of Type V in which some of the teeth become awn-like. It thereby becomes somewhat transitional to Type III. Type XIII stands in like relation to Types IV and VI.

Type VII. is decidedly rare, being confined to one species (the Mexican *S. microchaeta* Sch.-Bip.) with some approaches by one or two others. The type is very interesting. In it there are many awnlets and it thus suggests a much reduced pappus of Type VIII. yet 3–5 of the awnlets are more elongated than the others and thus hint at the inception or residual manifestation of a pauciaristate condition.

No hard and fast numerical distinction can be drawn between Types III and VIII or between IV and IX. In the pauciaristate series represented by Types III and IV the awns range normally from three to five and there seem to reach a natural maximum, though occasional achenes with 6–7 awns can be found in species which pretty clearly belong to the pauciaristate series. On the other hand in the multiaristate series represented by Types VIII and IX there are a very few (chiefly Brazilian) species, in which the awns usually range from seven to twelve, but sometimes drop to four, five or six. Thus the separation between the pauciaristate and multiaristate series would seem to break down. However, it is clearly a natural distinction of some importance. In general it can be seen at once and if we eliminate from consideration the idiocarps in Type IX and consider the number of awns in the adelphocarps only we find them rarely less than nine, in species of the multiaristate series. As we have seen, the

awns in the pauciaristate series appear to reach a natural maximum in the number five.

In the homomorphic achenes of Type VIII and in the adelphocarps of Type IX there is even in the same head a moderate variation in the number of the awns. This is quite to be expected in structures of indefinite number, that is to say not in fixed relation to some other morphological feature, such for instance as the angles or ribs of the achenes. However, there is usually no difficulty in distinguishing the idiocarp when one is present. This will be clearer by actual counts showing the number of awns present in heads of species illustrating Types VIII and IX.

Of Type VIII: *S. crenulata* Bak. 14-14-13-13-13; *S. gratioloides* Hook. & Arn. 11-11-11-10-10; and *S. Balansae* Hieron. 25-24-22-21-18.

Of Type IX. *S. crenata* Benth. 11-11-9-8-0; *S. melissaefolia* (Lam.) Sch.-Bip. 11-10-10-9-1; and *S. hyssopifolia* Phil. 11-11-10-10-3.

It is by no means maintained that the distinction between Types VIII and IX is always as clear as in these examples. However, intergradation between the types is not very frequent in nature.

At first it was hoped that this distinction between homocarpic and heterocarpic Stevias would have considerable classificatory significance and permit the division of the genus into recognizable groups of a natural character. However, further study has shown that it can be trusted only in moderate degree. In some cases it certainly presents a convenient and so far as observed a reliable distinction between good species and even between small groups of species, thus becoming a useful taxonomic character. In other cases, it is possible to demonstrate homocarpic and heterocarpic forms in material not otherwise separable and very certainly conspecific.

It is often possible to distinguish the idiocarp by traits other than its reduced pappus. Especially among the pauciaristate species of Mexico, the idiocarp can often be seen to be slightly plumper and distinctly smoother, especially on the faces of the achene, than are the adelphocarps in the same head. The idiocarp tends also to be precocious, being slightly in advance of the adelphocarps in development. On the other hand it is usually the last to fall away from the receptacle, often being found still in the closed involucre after the other achenes have dropped from it.

In efforts to account for the idiocarp the question whether its position is axial or abaxial naturally suggests itself. Is it uniformly one or the other or may it be either? Unfortunately these questions are not quite so easy to answer as would seem likely. In the first place a head must be fairly mature before it is possible to be quite sure of the

identity of the idiocarp and during the maturing of the head its position may be more or less altered by torsion of the pedicel or pressure of adjacent heads. The writer, confronted by the taxonomic complexities of the genus, has not been able to pursue this morphological point very far, but from the best dissections which he has been able to make without undue loss of time, infers that the idiocarp is rather more axial than abaxial but not precisely either. The best source of orientation is of course the bractlet commonly present at the base of the involucre. The idiocarp in the heads specially dissected to check this point was in a general way on the opposite side of the head from the bractlet but not exactly so. It seems probable, as already stated, that we have here to do with a spiral with its successive members at intervals of two-fifths of a revolution. If this is the case, the idiocarp is presumably in the axil of the outermost phyllary which would be 144° removed from the subtending bractlet.

Whether the idiocarp always occupies this position the writer would not presume to say. If so, its position will be almost the only constant feature in the whole genus.

The pappus of the *Compositae*, presumably vestiges of an earlier calyx-limb, takes on many forms. The most conspicuous and frequently discussed of these are its modifications (such as barbed awns, sail- or parachute-apparatus) which have clearly to do with dispersal. From this it is easy to infer that this curious heterocarpy may have some function of such nature. It is at first a bit hard to see how reduction or loss of pappus in one achene of each head could be helpful to dispersal, nevertheless there is one matter in this connection to which attention may here be called. The idiocarp, with its reduced or absent pappus, is likely to be less readily withdrawn from the involucre by such agencies as wind, rain, creeping insects or other passing animals. Somewhat confirming this is the fact that the idiocarp is often found still enveloped by an involucre which has already shed all the other achenes. This habit would at least tend somewhat to prolong the period of dispersal, and thus might thinkably have some slight influence in tiding the species through periods of drought or excessive moisture unfavorable to germination.

However, such hypotheses are exceedingly inconclusive. If variety favorably extends the period of dispersal, why is only one achene in each head thus modified? Furthermore, it is to be remembered that pappus, a vestigial structure, suffers a great many modifications in no way to be correlated with dispersal and even at times adverse to it.

As to the antiquity of heterocarpy in *Stevia*, there can be little doubt that the tendency toward it must go back to the origin of the

genus, for it manifests itself in all groups into which the genus can be divided, in annual, perennial and shrubby species, in those of moist ravines or open sandy plains, in extreme alpine forms and the most xerophytic developments of the genus. It occurs also in almost every region where the genus is found. Under these circumstances it must, as an inherited tendency, date back to the original differentiation and diffusion of the genus.

Stevia presents many unsolved problems. What for instance, is the relative fertility of the adelphocarps and the idiocarp? Is there a difference in the duration of their viability? What differentiation, if any, could be brought about in strains grown, on the one hand from adelphocarps, and on the other from idiocarps? To what extent can these pappus-habits be fixed, intensified, or otherwise modified by selection? How do they act during hybridization? Many such questions readily present themselves. However alluring such lines of inquiry may appear, they could scarcely be pursued effectively except by those who have opportunity to study living material, preferably in its natural habitats.

From the foregoing summary of the history and peculiar morphological features of *Stevia*, its difficulties from the taxonomic point of view should be fairly evident. Involucral and floral distinctions are singularly few. The pappus-differences, though abundant, have proved to be of little value for classificatory purposes. The species are fairly numerous and in the past have been much confused. To group and key them clearly on the basis of differences of habit, foliage and inflorescence has thus far proved impossible for the genus as a whole. After several disappointing attempts in this direction, it has been found best to narrow the task and reduce the complexity of the keys by treating successively the Stevias of different countries and regions. It is thus possible to make these local revisions far more convenient for the use of botanists resident in the particular regions covered than a necessarily complex general treatment of the genus would be likely to prove even if such were at present feasible.

At this time it is possible to put on record such regional revisions of the Stevias thus far known (1) from the Argentine Republic, (2) from Paraguay, and (3) from Mexico and Central America including the few species which extend into the United States. So far as the elements they cover are concerned these revisions are almost mutually exclusive. They deal, so to speak, with lobes of the genus in a natural as well as a geographic sense. When these outlying portions of the

OF
WASHINGTON
UNIVERSITY
ST. LOUIS, - MO

genus, including rather more than half of its species, have been thus dealt with, it is hoped that the remaining more tropical elements, perhaps also divided into regional groups, can be similarly treated in the not too distant future.

THE STEVIAS OF THE ARGENTINE REPUBLIC.

Through the publications of Hooker & Arnott, Grisebach, and especially those of Hieronymus, mentioned in the foregoing observations, the Argentine Stevias have been rather more throughly recorded than those of the other South American countries. Thus far, however, the many species and varieties proposed by Hieronymus have been little understood and authentic material of them has been exceedingly scarce even in the largest herbaria except at Berlin where he worked.

Efforts to classify later collections of Argentine material by reference to the publications of Hieronymus met with no slight difficulty. While his decriptions were admirably detailed, his proposed species were numerous and at times technical to artificiality. His long and carefully drawn diagnoses described individuals, ecological states or local forms rather than species recognizable in nature and capable of being keyed apart and thus rendered effective classificatory entities.

Many of his species are undoubtedly valid. Others, though not quite identical as to their types, must in the interests of sound classification be reduced because their supposed differential traits prove inconstant and are not substantiated by distinctions of habit. The chief task involved in the present treatment was to conserve just as many of these recorded Argentine Stevias as could be distinguished with a fair degree of clearness and to bring the rest into appropriate varietal or synonymic relation to these.

The writer has twice visited the Botanical Museum at Berlin to study the types of Hieronymus and by the Direction of the Museum has been accorded every possible facility to examine and photograph these specimens so important to an understanding of the Argentine flora. He is further and very particularly indebted to Professor Miguel Lillo of the University of Tucumán for an extended series of Argentine Stevias collected not only by himself but by many other discriminating and effective collectors including Messrs. Schreiter, Castillon, Venturi, Jörgensen, Rodriguez, Giacomelli, and Pereyra. Without this illustrative collection brought together with scholarly attention to detail by Professor Lillo and contributed with characteristic generosity, the present revision could scarcely have been undertaken.

Further aid of importance has been derived from recent and exceptionally excellent sets of plants collected and distributed by Venturi, not only from different parts of Tucumán but from the less known provinces of Salta, Jujuy, and Santiago del Estero. The Stevias in the great Stuckert herbarium recently acquired by the Botanical Conservatory at Geneva have also been available for study through a loan very kindly permitted by the Director, Professor John Briquet. The all too sparing and fragmentary specimens of Lossen have been examined in several herbaria. A recent loan of the Argentine Stevias in the herbarium of the Missouri Botanical Garden, obligingly permitted by Dr. Greenman, has proved helpful, yielding in many particulars gratifying confirmation of results previously attained through study of other collections.

Key to the Argentine Species of Stevia.

a. Pappus a short crown of scales (often more or less connate into a ring or cup) usually accompanied by at least 1–5 and rarely (in no. 3) by 6–7 awns; these sometimes mere cusps little exceeding the crown sometimes developed into bristles nearly as long as the corolla. Subg. Eustevia.....*b.*

b. Inflorescence loose to diffuse, the mature pedicels about equalling to much exceeding the involucres....*c.*

c. Leaves narrowly linear to linear-lanceolate.....1. *S. Fiebrigii.*

c. Leaves rhombic-lanceolate to rhombic-ovate, acute to acuminate.....2. *S. yaconensis.*

c. Leaves elliptic-oblong, obtusish to rounded at tip....3. *S. Schreiteri.*

b. Inflorescence or its component parts much denser, the heads sessile or the pedicels, if developed, normally shorter than the involucres....*d.*

d. Main cauline leaves deltoid- to rhombic-ovate, mostly 2–4 cm. wide....*e.*

e. Inflorescence a dense corymb of mostly contiguous or closely adjacent campanulate or subglobose glomerules of sessile or subsessile heads....*f.*

f. Internodes conspicuously elongated, mostly much exceeding the leaves.....4. *S. Schickendantzii.*

f. Internodes (with few exceptions) shorter than the leaves....*g.*

g. Leaf-blade cuneate to subtruncate at base, glabrous beneath except on nerves and veins; reticulation of veinlets dark, readily distinguishable.....5. *S. alpina.*

g. Leaf-blade deeply cordate, finely incurved-puberulent on the lower surface; reticulation of veinlets light-colored and obscure.....6. *S. Lilloi.*

e. Inflorescence terminal, fastigiately branched, of many contiguous dense cymes, the heads shortly pedicelled. 7. *S. sanguinea.*

e. Inflorescence open, consisting of separate campanulate glomerules; these paniculate or corymbosely disposed. 8. *S. breviaristata.*

d. Main cauline leaves lanceolate, medium-sized, mostly 1–2.5 cm. wide....*h.*

h. Leaves obtuse; plant 1.5–3 dm. high.....9. *S. nevadensis.*
h. Leaves acute to attenuate; plants mostly 3–6 dm. high....*i.*
i. Heads (or most of them) distinctly pedicelled, borne in fastigiate cymes.....10. *S. effusa.*
i. Heads sessile or nearly so in dense glomerules....*j*
j. Leaves 4.5–6.5 times as long as wide....11. *S. potrerensis.*
j. Leaves mostly 2.5–4 times as long as wide....*k*
k. Stems many from a somewhat creeping base 12. *S. procumbens.*
k. Stems (1–2) not rooting at the basal nodes....13. *S. vaga.*
d. Leaves small, even the main cauline rarely over 6 mm. wide....*l.*
l. Leaves rhombic-ovate to elliptic-oblong, crenate. 14. *S. Chamaedrys.*
l. Leaves linear to narrowly lanceolate, entire or sharply few-toothed....*m.*
m. Heads about 1 cm. long; awns of the adelphocarps 5; phyllaries glandular-puberulent....15. *S. minor.*
m. Heads 12–14 mm. long; awns 0–3; phyllaries incurved-puberulent with incurved glandless hairs.....16. *S. Gilliesii.*
a. Pappus (at least of the adelphocarps) consisting of 10–25 bristle-like awns about equalling the corolla....*n.*
n. Heads borne singly; pedicels at maturity (mostly 6–20 mm. long) equalling or commonly much exceeding the involucre ....*o.*
o. Phyllaries incurved- or appressed-puberulent with delicate glandless white hairs, some sessile glands being interspersed....*p.*
p. Leaves lanceolate, thickish but not rigid, 3-nerved from slightly above the attenuate base, finely pubescent on both surfaces.....17. *S. cinerascens.*
p. Leaves oblong-lanceolate, thick, firm, very veiny, 3-nerved from the rounded or obtuse closely sessile base, subglabrous.....18. *S. Lundiana.*
o. Phyllaries spreading-puberulent with straight gland-tipped hairs....*q.*
q. Mature cauline leaves linear to lanceolate 1–6(–9) mm. wide, entire or obscurely denticulate.....19. *S. multiaristata.*
q. Mature cauline leaves rhombic-oblong to oblanceolate, 10–25 mm. wide, conspicuously toothed at least toward the tip.....20. *S. entreriensis.*
n. Heads aggregated in cymose or capitate clusters; pedicels (mostly 0–4 mm. long) rarely equalling the involucre.....*r.*
r. Leaves rhombic-oblong to oblanceolate; pappus-bristles (of the adelphocarps) 15–23....*s.*
s. Panicle fastigiately branched, flattish-topped; phyllaries spreadingly glandular-puberulent. Here may be sought short-pedicelled forms of.....20. *S. entreriensis.*
s. Panicle loosely branched, convex to elongated; phyllaries incurved-puberulent.....21. *S. aristata.*
r. Leaves narrowly lanceolate to linear; pappus-bristles of the adelphocarps 7–12 (or rarely lacking).....22. *S. mercedensis.*
r. Leaves linear or nearly so; pappus-bristles of the adelphocarps usually 15–21.....23. *S. sautureiaefolia.*

1. **S. Fiebrigii** Hieron. Herbaceous or nearly so, very slender, erect or more or less recumbent; leaves narrowly lance-linear to linear, often proliferous from the axils, some of them opposite but the majority alternate, finely and rather remotely serrate from near the middle to the tip or quite entire, glabrous or nearly so; inflorescence an alternate-branched diffuse panicle; pedicels elongated, filiform; heads slender, 10–12 mm. long; phyllaries linear, acute, subappressed-villulose; corolla-tube purple, the limb white or roseate.—Hieron. in Engl. Bot. Jahrb. xl. 365 (1908).—The typical variety, thus far known only from Bolivia, is erect and has its larger stem-leaves lance-linear, finely toothed and as much as 5 mm. wide, and its achenes normally exaristate. The following Argentine variety seems clearly conspecific.

Var. **gracillima** Robinson. Exceedingly slender and probably recumbent; leaves all linear and entire, 1–2 mm. wide; pappus of the adelphocarps composed of scales and 3–5 awns, the idiocarp crowned with scales only.—Contrib. Gray Herb. xc. 13 (1930).

SALTA: among stones, La Candelaria, alt. 1500 m., *Venturi*, no. 3679 (Gr.).

2. **S. yaconensis** Hieron. Erect or curved-ascending, 3–9 dm. high; stem leafy; leaves (except the uppermost) opposite, lance-ovate, serrate except toward the cuneate base, nearly glabrous, distinctly punctate, paler beneath, the mature cauline 6–8 cm. long and 3 cm. wide; inflorescence loosely paniculate, the slender-pedicelled heads often nodding; corolla-throat and tube deep purple, the limb pink; achenes heteromorphous, 3–4 (adelphocarps) provided with 1–2 awns each (as well as scales), 1–2 (idiocarps) bearing scales only.—Hieron. in Engl. Bot. Jahrb. xxii. 724 (1897). A species now recognizable in four tendencies, all occurring in the Argentine Republic.

KEY TO THE VARIETIES OF S. YACONENSIS.

Phyllaries beset with short spreading gland-tipped hairs.
  Awns of the adelphocarps rudimentary, 1–1.3 mm. long..Var. *α. typica.*
  Awns of the adelphocarps 3–5 mm. long.....Var. *β. saltensis.*
Phyllaries incurved-puberulent with white glandless hairs.
  Awns of the adelphocarps much shorter than the corollas.
    Var. *γ. subeglandulosa.*
  Awns of the adelphocarps almost as long as the corollas..Var. *δ. aristifera.*

Var. *α.* **typica.** Heads mostly 9–11 mm. long; awns not evident when the involucre is closed; phyllaries at least when young minutely glandular-hispid.

SALTA: Quebrada de San Lorenzo, *Hieronymus & Lorentz*, no. 539 (Brl., phot. Gr., U. S.); in woods, San Lorenzo, *Lillo*, no. 8103 (Gr.).
TUCUMÁN: Cerro Duraznillo, alt. 700 m., *Lillo*, no. 15,925 (Gr.).

Var. β. **saltensis** (Hieron.) Robinson. Habit, foliage, glandular-hispid phyllaries, etc., closely as in var. *typica*, but heads slightly larger (about 12 mm. long) and the adelphocarps each with 2–3 awns clearly protruding from the closed involucre.—Contrib. Gray Herb. xc. 21 (1930). *S. saltensis* Hieron. in Engl. Bot. Jahrb. xxii. 725 (1897).

SALTA: near Los Potreros, at the foot of Nevado del Castillo, *Hieronymus & Lorentz*, no. 170 (Brl., phot. Gr.).

Var. γ. **subeglandulosa** Hieron. Pedicels and phyllaries covered with a short incurved grayish glandless puberulence with or without a few sessile lucid glands; awns short, not exserted from the involucre.—Hieron. l. c. xl. 366 (1908).

TUCUMÁN: Altos de las Salinas, alt. 1000 m., *Lillo*, no. 2439 (Gr.); La Criolla, alt. 1200 m., *Rodriguez*, no. 370 (*herb. of Lillo*, no. 11,225).
JUJUY: Dept. Capital: slope of the Sierra, Leva, alt. 1700 m., *Venturi*, no. 8707 (Gr., Mo.); in the valley of the Rio Grande, Abra Pampa, Dep. Cochinoca, *Venturi*, no. 9343 (Gr.).
CATAMARCA: El Potrero, Ambato, *Castillon*, no. 1143 (Gr.).
[Southern Bolivia.]

Var. δ. **aristifera** Robinson. Habit, foliage and inflorescence much as in var. *typica*, but phyllaries rather closely incurved- or appressed-puberulent with white glandless hairs interspersed with a few lucid sessile glands; pappus of the adelphocarps including 1–3 dark purple awns, at least some of them well exserted from the involucre.—Contrib. Gray Herb. xc. 21 (1930).

JUJUY: Dept. Tumbaya: Volcán, Abra de la Laguna, alt. 2500 m., *Schreiter*, no. 2685 (Gr.). Dept. Humahuaca: slopes of Cerro La Soledad, alt. 2800 m., *Venturi*, no. 8635 (Gr.), a specimen in secondary (rameal) foliage after the stem leaves have fallen.
TUCUMÁN: Cuesta Oriental de Lara, alt. 2500–3000 m., *Schreiter*, no. 1603 (Gr.).

3. **S. Schreiteri** Robinson. Slender perennial herb, leaning or reclining from above a suberect base; stem terete, about 1.5 mm. in diameter, reddish, finely grayish-puberulent with very short incurved glandless hairs, flexuous, branched; internodes mostly 2–3.5 cm. long; branches curved-ascending; leaves opposite, oblong to elliptic, subentire to rather coarsely crenate-serrate, obtuse, thinly membranaceous, 3-nerved, minutely papillose above, subglabrous and scarcely paler beneath, 3–3.5 cm. long, 1–1.8 cm. wide, borne on narrowly cuneate-winged petioles 1.5–2.5 cm. in length; inflorescences terminating the branches, geniculate, sympodial, few-headed; pedicels about 1 cm. long, appearing opposite the small bracts; heads slender, 1 cm. long; phyllaries linear, acute, green, incurved-puberulent; corollas

white; achenes almost uniform, 6–7-aristate; awns pale, distinctly exceeding the corolla, accompanied by a few narrow scales (0.7 mm. in length).—Contrib. Gray Herb. xc. 19 (1930).

SALTA: Dept. Orán: Zanja Honda, alt. 600 m., *Schreiter*, no. 3637 (Gr.).

4. **S. Schickendantzii** Hieron. Upright perennial herb, 5–15 dm. high; stem at first shortly and spreadingly glandular-puberulent, at length glabrescent, leafy to the often forked summit; internodes sometimes as much as 13 cm. in length; leaves rhombic-ovate, obtuse to blunt-tipped-acuminate, crenate-serrate, mostly 4–6 cm. long and half as wide, sessile or nearly so by a narrowed base, slightly puberulent above, pubescent especially upon the nerves and veins beneath; heads sessile in dense glomerules subtended by lance-linear foliaceous bracts of nearly equal length; phyllaries greenish-stramineous, lance-linear, acute, glandular-puberulent; corollas yellowish or greenish white; achenes 4 mm. long, all bearing a scale-pappus (about 0.5 mm. high); the adelphocarps (4) each bearing also 1–2 awnlets not exceeding 2 mm. in length.—Hieron. in Engl. Bot. Jahrb. xxii. 717 (1897).

CATAMARCA: at the Estancia Yacatula near Belen, *Schickendantz*, no. 146 (Brl., phot. Gr.).
LA RIOJA: El Pié de la Cuesta above the Estancia El Vallecito in the Sierra Famatina, *Hieronymus & Niederlein*, no. 722 (acc. to Hieronymus, l. c.).
TUCUMÁN: Dept. Tafí: Cuesta de Anfama, alt. 2000 m., *Schreiter*, no. 4257 (Gr.).

5. **S. alpina** Griseb. Erect herb 1–2 m. high, puberulent; leaves ovate or often rhombic-ovate, rather gradually narrowed to the tip, coarsely serrate except toward the often abruptly contracted and then cuneately narrowed base, the mature cauline 7–15 cm. long, 3–6(–9) cm. wide; heads sessile or nearly so in dense glomerules and these disposed in a compact round-topped terminal corymb; phyllaries linear-oblong, acutish, finely incurved-puberulent and sprinkled with a few lucid sessile glands or sometimes nearly glabrous; corollas white to light pink; pappus of short scales and at least in most of the adelphocarps 1–3 awnlets (1–3 mm. in length).—Goett. Abh. xix. 165 (reprint 116) (1874); Symb. 166 (1879); Hieron. in Engl. Bot. Jahrb. xxii. 717 (1897). *S. Grisebachiana* Hieron. l. c. 716 (1897), founded on exceptionally luxuriant specimens but without distinctions of taxonomic value.

SALTA: at the foot of the Nevado del Castillo, *Lorentz & Hieronymus*, no. 152 (acc. to Hieronymus, l. c., as *S. Grisebachiana*).
TUCUMÁN: on the mountain range of the Cuesta del Garabatal in the Sierra de Tucumán, *Lorentz & Hieronymus* (Brl., phot. Gr.); Vipos, Dept. of Trancas, alt. 780 m., *Schreiter*, no. 4158 (Gr.); Cañada del Moñoz, Tafí del Valle, *Castil-*

lon, no. 2799 (Gr.); Rincón, Tafí, *Castillon*, no. 9 (Gr.); Rio Blanco, Tafí, *Castillon*, no. 3493 (Gr.); in alpine meadows, Malamala, alt. 2000 m., *Lillo*, no. 4366 (Gr.).

CATAMARCA: near Vayas Altas in the Sierra de Belen, alt. 2750–3350 m., *Lorentz*, no. 620 (Brl., phot. Gr.); El Candado, Dept. Andalgalá, *Jörgensen*, no. 1664 (Gr., U. S., Mo.).

6. **S. Lilloi** Robinson. Herbaceous, erect, 1 m. high; stem terete, virgate, leafy to the summit; pith white; leaves opposite, petiolate, ovate, caudate-acuminate, coarsely and bluntly serrate, deeply cordate, 7–9 cm. long, 4–5 cm. wide, finely appressed- or incurved-puberulent on both surfaces, distinctly paler beneath; petiole about 1.5 cm. long, slightly winged toward the summit; corymb compound, rounded dense, composed of mostly contiguous glomerules; heads sessile, 9 mm. long; corolla red, covered with soft short crisped or subappressed white hairs; achenes homomorphous or nearly so, all crowned by a short scale-pappus together with 1–2 awnlets (1–3 mm. long).—Contrib. Gray Herb. xc. 14 (1930).

TUCUMÁN: in primeval forests, Alto de Medina, alt. 1460 m., *Herb. of M. Lillo*, no. 15,924.

7. **S. sanguinea** Hieron. Erect herbaceous perennial, slightly lignescent toward the base, about 1 m. high, leafy to the inflorescence; stem glandular-pubescent when young; leaves opposite, attenuate, serrate except at the subtruncate base, membranaceous, puberulent on both surfaces, above bright green or somewhat purplish, beneath subglaucous, the mature cauline about 7 cm. long and half as wide; inflorescence a round-topped rather dense fastigiately branched compound corymb; heads sessile or more often shortly pedicelled; achenes heteromorphous, 4 of them crowned by scales (about 0.4 mm. long) together with 1–3 awnlets, the fifth (idiocarp) with scale-pappus only.—Hieron. in Engl. Bot. Jahrb. xxii. 714 (1897). *S. camporum* Griseb. Symb. 166 (1879), not Bak., acc. to Hieronymus, l. c.

SALTA: near the Station Yacone in the foothills of the Nevado del Castillo, *Hieronymus & Lorentz*, no. 535 (Brl., phot. Gr.).

8. **S. breviaristata** Hook. & Arn. Erect perennial herb usually about 6 dm. high; stem simple below, often ascendingly branched from the middle; leaves opposite, the main cauline ovate, acutish to attenuate, serrate often coarsely so, membranaceous, green and appressed-villulose above, slightly paler and pubescent only on the nerves and veins beneath, mostly 5–8 cm. long and about half as wide, borne on cuneately winged petioles (1–4 cm. long); inflorescence usually rather freely branched, the branches terminating in subturbinate or subspherical glomerules of sessile heads; phyllaries beset with short

spreading (sometimes sparse or obsolescent) gland-tipped hairs or with incurved white glandless hairs; corolla with crimson to violet throat and roseate limb or occasionally white; pappus of short scales somewhat surpassed by 1–3 toothlike awnlets; these mostly 0.5–2 mm. long, rarely 1–2 of them developed into a bristle of greater length.—Comp. Bot. Mag. i. 238 (1836); Hook. in Curt. Bot. Mag. t. 3792 (1840), where illustrated from greenhouse grown and somewhat uncharacteristic material with larger glomerules and more shortly petioled leaves than shown by the original collection. *S. Lorentzii* Griseb. Goett. Abh. xix. 164 [by error numbered 416], reprint 117 (1874). *S. pubigera* Hieron. in Engl. Bot. Jahrb. xxii. 720 (1897), incl. var. *subglabrata*. *S. Schultzii* Hieron. l. c. 721 (1897) probably, at least as to Argentine material so referred.

SALTA: in woods, Quebrada San Lorenzo, alt. 1400 m., *Lillo*, no 8117 (Gr.); Yacone, at foot of Nevado del Castillo, *Lorentz & Hieronymus*, nos. 320 (Brl., phot. Gr.) and 324 (Brl., phot. Gr.); Los Potreros, *Lorentz & Hieronymus*, no. 151 (Brl., phot. Gr.; N. Y.); slopes of the hills in tall forests, Los Baños, Dept. Rosaria de la Frontera, alt. 900 m., *Venturi*, no. 6168 (Gr.)

TUCUMÁN: woods of Tucumán, *Tweedie*, no. 1201 (K., phot. Gr.); on slopes of mountains among bushes, Cerro El Nogalito, alt. 1200 m., *Venturi*, no. 8870 (Gr., Mo.); on plains, Tafí, alt. 2000 m., *Lillo*, no. 5747 (Gr.); in fields, Cruz Alta, alt. 400 m., *Lillo*, no. 91 (B) (Gr.); Tafí, Mesopotamia, *Castillon*, no. 7 (Gr.); Siambon, Sierra de Tucumán, *Lorentz*, no. 203 (Brl., phot. Gr.); Las Cejas, *Lillo*, no. 18,870 (Gr.); La Lagunita, alt. 2200 m., *Rodriguez*, no. 11,253 (Gr.); on sandy plains, Chañar Poza, alt. 300 m., *Venturi*, no. 364 (Gr.); Leales, *Lillo*, no. 14,979 (Gr.); Cumbre de San Javier, alt. 1000 m., *Schreiter*, no. 5739 (Gr.); in grassy meadows, Cuesta Malamala, alt. 3000 m., *Lillo*, no. 4353 (Gr.); in meadows, La Cienaga, alt. 2500 m., *herb. of M. Lillo*, no. 4060 (Gr.); Cuesta de Anfama, alt. 2000 m., *Schreiter*, no. 1667 (Gr.); in farm hedges, Quintas-Capital, alt. 450 m., *Lillo*, no. 1672 (Gr.); bank of stream, Rio Salí, Dept. Capital, alt. 450 m., *Venturi*, no. 5007 (Gr.); in meadows on the plains, San Javier, *Lillo*, no. 1632 (Gr.).

SANTIAGO DEL ESTERO: banks of the Rio Salí, *Venturi*, no. 6126 (Gr.).

LA RIOJA: Chiliceto, Sierra de Famatina, Camino a La Mejicana, alt. 2550 m., *Parodi*, no. 8054 (Gr.)?

LOCALITY UNSTATED: in fields, *Lillo*, no. 7553 (Gr.).

[BOLIVIA.]

Though showing a moderate degree of variability in foliage, pubescence, flower-color and pappus this species does not lend itself to subdivision. The pappus-teeth or awnlets are sometimes absent in one or more of the achenes in each head; on the other hand they occasionally become slender and bristle-like.

9. **S. nevadensis** Hieron. Low erect or somewhat decumbent perennial (?), ascendingly and rather profusely branched from below the middle, 2–3 dm. high, puberulent; leaves opposite, sessile or (the lower) subpetiolate, rhombic-ovate, obtuse or obtusish, subentire to distinctly crenate except toward the entire cuneately narrowed base,

membranaceous, subconcolorous, sparsely puberulent; heads about 9–10 mm. long, shortly pedicelled and borne in rather dense glomerules; these disposed singly at the ends of the branches or borne in a flattish-topped corymb; phyllaries oblong-lanceolate, acute, pale green, sometimes purple-tinged toward the tip, finely pubescent on the back; corollas with tube and throat dull purple and the limb pale pink; pappus of short scales and (at least in the adelphocarps) of dark purple awns exserted from the involucre and nearly equalling the corolla.—Hieron. in Engl. Bot. Jahrb. xxii. 729 (1897).

Salta: between Los Potreros and the Nevada del Castillo, *Hieronymus & Lorentz* (Brl., phot. Gr.).
Jujuy: Hualchin, alt. 3000 m., *Lillo*, no. 11,788 (Gr.); Tiraxi, Volcán, alt. 3000 m., *Castillon*, no. 5741 (Gr.).

10. **S. effusa** Hieron. Erect copiously branched perennial herb, leafy to the summit; stem slender, puberulent, at length glabrate; leaves opposite, sessile or (the lower) short-petioled, lanceolate, attenuate, rather coarsely serrate, thinly membranaceous, the largest 7–8 cm. long, 2–3.5 cm. wide; heads 8–9 mm. long, shortly but for the most part distinctly pedicelled in fastigiately branched cymes; these (often surpassed by the subtending bracts) usually disposed in a loose leafy-bracted flattish-topped compound corymb; corollas white or roseate; pappus of short scales and (in the adelphocarps) 1–3 bristles or at least awnlets.—Hieron. in Engl. Bot. Jahrb. xxii. 710 (1897).—A species in which the following varieties may usually be distinguished.

Var. α. **typica**. Awns of the adelphocarps much exserted from the involucre and about equalling the corollas, stramineous or more often purple toward the tip.

Salta: among stones on the mountains, Campo Quijano, alt. 1200 m., *Venturi*, no. 8054 (Gr., Mo.).
Tucumán: Lomas de Frias, Tafí, *Castillon*, no. 8 (Gr.); Cumbre de San Javier, Tafí, alt. 1000 m., *Schreiter*, no. 5740 (Gr.).
Catamarca: near Fuerte de Andalgalá, *Schickendantz*, no. 216 (Brl., phot. Gr.).
La Rioja: Aquadita, *Giacomelli*, no. 4767 (Gr.).

Var. β. **saltensis** Hieron. Awns of the adelphocarps shorter, usually concealed by the involucre, for the most part reduced to mere awnlets or teeth.—Hieron. l. c. xxii. 711 (1897).

Salta: San Jose, *Hieronymus & Lorentz*, no. 226 (Brl., phot. Gr.).
Tucumán: Vipos, Dept. of Trancas, alt. 780–786 m., *Schreiter*, nos. 4159 (Gr.) and 5738 (Gr.); Cerro del Campo, alt. 900 m., *Lillo*, no. 15,923 (Gr.).

The writer has found it quite impossible to correlate with the

pappus-characters of these varieties the foliar and pubescence distinctions suggested by Hieronymus.

11. **S. potrerensis** Hieron. Erect perennial herb 6–8 dm. high; stem simple below, often branched above the middle, leafy throughout; leaves opposite, lanceolate or oblanceolate, attenuate to an acute tip, finely serrate except on the distinctly contracted petioliform basal portion, membranaceous, puberulent on both surfaces, paler beneath, the largest 6–8 cm. long, 1–1.7 cm. wide; heads sessile in corymbosely disposed glomerules; phyllaries pale green, about 5 mm. long, sparingly glandular-puberulent or often covered with grayish mostly incurved glandless hairs; corollas with white or roseate limb but usually with a more deeply colored probably purple tube and throat; pappus of short scales and (at least in the adelphocarps) 2 awnlets 1–1.5 mm. long, not exceeding the involucre.—Hieron. in Engl. Bot. Jahrb. xxii. 715 (1897).

SALTA: near Los Potreros at the foot of the Nevado del Castillo, *Lorentz & Hieronymus* (Brl., phot. Gr.); on the plains, Salta, *Lillo*, no. 8088 (Gr.).
JUJUY: on river banks, Jujuy, *Lillo*, 9667 (Gr.); Volcán, Loma de la Laguna, alt., 2200 m., *Schreiter*, no. 2684 (Gr.).

This species can be pretty readily separated from *S. sanguinea* and *S. effusa* by its sessile heads. The three are closely related and some intergradation may be expected. *S. potrerensis* was founded on a specimen with scanty and chiefly glandular puberulence, but later seemingly conspecific material runs chiefly to more copious and glandless puberulence.

12. **S. procumbens** Hieron. Herbaceous perennial, somewhat decumbent and somewhat repent at the base; stems several, distinctly rooting from the lower nodes, about 3 dm. long, slender, leafy to the summit; leaves opposite, sessile or nearly so, lanceolate, acute at each end, rather remotely and finely serrate, smoothish, distinctly paler beneath, membranaceous, the largest 4.5 cm. long and 1.3 cm. wide; heads about 9 mm. long, sessile or subsessile in dense glomerules disposed in a leafy-bracted compound corymb; phyllaries linear, acute, 5–6 mm. long, often violet-tinged toward the tip, the outer finely and rather sparingly incurved-puberulent and beset with a few sessile glands; corollas with pale flesh-colored or pink limb and purple throat; pappus of exceedingly short scales (scarcely 0.2 mm. in length) and 2–4 purple bristle-like awns about 4.5 mm. long.—Hieron. in Engl. Bot. Jahrb. xxii. 728 (1897). *S. Gillicsii* Griseb. Symb. 166 (1879) in part, not Hook. & Arn.

SALTA: at the foot of the Nevado del Castillo near Potreros, *Hieronymus & Lorentz*, no. 175 (Brl., phot. Gr., N. Y., phot. Gr.).

13. **S. vaga** Griseb. Suffrutescent, at length profusely branched, puberulent, 4–15 dm. high; stem and branches slender, terete, often flexuous; leaves opposite, lanceolate, acuminate, serrate, cuneately contracted to a short scarcely winged petiole or petioliform base, the largest 5–7 cm. long and 1–2 cm. wide, membranaceous, often proliferous from their axils, finely appressed- or incurved-puberulent above, paler and more loosely pubescent at least on the veins beneath; inflorescence of rather dense glomerules disposed in a somewhat loosely branched panicle or more closely grouped in a flattish-topped corymb; heads 9–11 mm. long, sessile or a few of them shortly pedicelled; phyllaries lance-linear, acute, green or toward the tip purple-tinged, finely puberulent, the hairs often gland-tipped, sometimes few or obsolete, sessile glands often present; corollas usually roseate, sometimes white; pappus of short scales and (in the adelphocarps) usually 2–4 bristle-like awns, these being of variable length and sometimes wholly lacking.—Goett. Abh. xix. 165 [116 of reprint] (1874); Hieron. in Engl. Bot. Jahrb. xxii. 710 (1897). *S. Gilliesii* Griseb. Symb. 166 (1879) in part, not Hook. & Arn. *S. diversipapposa* Hieron. l. c. 708 (1897) incl. formae *exaristata, breviaristata,* and *longiaristata* Hieron. l. c. 709 (1897). *S. achalensis* Hieron. l. c. 712 (1897). *S. procumbens* var. *tucumanensis* Hieron. l. c. 729 (1897).

JUJUY: Volcán, alt. 2500 m., *Castillon,* no. 5742 (Gr.).

TUCUMÁN: Cumbre de Anfama, alt. 2500–2700 m., *Schreiter,* nos. 885 (Gr.), 2979 (Gr.), and 2980 (Gr.); La Criolla, alt. 1200 m., *Rodriguez,* no. 11,211 (Gr.); in alpine meadows, Malamala, alt. 200 m., *Lillo,* no. 2690 (Gr.); Cuesta Oriental de Lara, alt. 3000–3500 m., *Schreiter,* no. 1345 (Gr.); Villa Nouguis, *Castillon,* no. 652 (Gr.); Estancia La Ciénaga in the Sierra de Tucumán, *Lorentz,* no. 153 (Brl., phot. Gr.); Estancia Santa Rosa on bank of Cascada River, alt. 3200 m., Dep. Chicligasta, *Venturi,* no. 4739 (Gr., Mo.).

CATAMARCA: Yacutula, *Lorentz,* no. 667 (Brl., phot. Gr.); Rodeo, Ambato, *Castillon,* no. 3011 (Gr.); Andalgalá, *Jörgensen,* no. 1134 (Gr., Mo., U. S.).

LA RIOJA: near Mina del Oro in the Sierra Famatina, *Hieronymus & Niederlein,* no. 426 (Brl., phots. Gr.), the collection on which Hieronymus based the three pappus-forms of his *S. diversipapposa.*

CORDOBA: Sierra Chica, *Lossen,* no. 238 (Gr., Mo.); in gorge at foot of the Gigantes, Sierra Achala, *Galander* (Brl., phot. Gr.); Huerta Grande, Sierra Chica de Cordoba, *Stuckert,* nos. 1786 (Gen.) and 1907 (Gen.); Los Cocos, Dept. Punilla, *Stuckert,* no. 18,648 (Gen.).

A species with perplexing inconstancy, all its minor characters appearing to vary independently. A varietal and formal subdivision based on pappus-differences, pubescence, leaf-contour, corolla-color, etc., might easily be carried to much complexity but would have little value unless substantiated by observation in nature and the examination of much more copious material.

14. **S. Chamaedrys** Griseb. Low herbaceous perennial, branched

almost from the base or several-stemmed from a short suberect or sometimes horizontal strongly rooted caudex; stems (mostly 1–2 dm. long) and branches slender, flexuous, often curved-ascending, leafy to the summit, closely covered with fine white articulated mostly gland-tipped hairs; leaves opposite (except the uppermost), sessile, rhombic-ovate to elliptic-oblong, obtuse, sparingly crenate to entire, cuneate at base, 3-nerved, pubescent on both surfaces, 1–2 cm. long, 5–8 mm. wide; heads about 12 mm. long, sessile or subsessile in dense terminal glomerules; phyllaries lance-oblong, acute, green or purple-tinged, covered with spreading usually viscid hairs; corollas with usually purplish tube and throat and pink or white limb; pappus of well developed blunt scales (0.3–0.4 mm. long) sometimes accompanied by 1–2 short awns or more often by 2–3 bristle-like usually dark purple awns nearly as long as the corolla.—Goett. Abh. xxiv. 167 (1879); Hieron. in Engl. Bot. Jahrb. xxii. 729 (1897).

JUJUY: level places among the summits, Sierra del Aguila, Dept. Humahuaca, alt. 4000 m., *Venturi*, no. 8723 (Gr., Mo.).
SALTA: near Los Potreros at the foot of the Nevada del Castillo, *Lorentz & Hieronymus*, no. 171 (Brl., U. S., N. Y., phot. Gr.).
TUCUMÁN: in grassy meadows, El Infiernillo, alt. 3500 m., *Lillo*, no. 5634 (Gr.); Derrumbado, Dept. of Tafí, alt. 3800 m., *Schreiter*, no. 4236 (Gr.).

15. **S. minor** Griseb. Low perennial from strongly rooted sometimes shortly sarmentose base; stems several to many, erect or nearly so, 1–2 dm. high, leafy to the inflorescence; leaves opposite, sessile, narrowly lanceolate to linear-oblong, entire or obscurely few-toothed, 1(–3)-nerved, gray-puberulent on both surfaces, mostly 15–20 mm. long and 2–4 mm. wide; heads about 1 cm. long, sessile or subsessile in dense capitate terminal or subterminal glomerules; phyllaries narrowly lance-oblong, acute or acutish, green or purple-tinged, hispid with short spreading mostly gland-tipped hairs; corollas with purple-violet throat and paler roseate limb; pappus of scales scarcely 0.5 mm. long and mostly 4–5 slender purple bristle-like awns nearly equalling the corolla.—Goett. Abh. xix. 166 [118 of reprint] (1874); Hieron. in Engl. Bot. Jahrb. xxii. 730 (1897).

SALTA: Cerro del Cajón, alt. 4940 m., *Rodriguez*, no. 16,826 (Gr.) a specimen clearly showing the sarmentose tendency of the species.
TUCUMÁN: Macho Rastrojo (Cuesta Occidental de Lara), alt. 3000–3500 m., *Schreiter*, no. 1342 (Gr.).
CATAMARCA: common in mountain valleys of Nacimientos, *Lorentz*, no. 420 (Brl., phot. Gr.).

16. **S. Gilliesii** Hook. & Arn. Slender perennial herb mostly 2–3 dm. high, finely gray-puberulent throughout with glandless hairs; stems several, strictly erect or curved-ascending, 1–2 mm. in diameter,

leafy to the inflorescence; leaves scattered, often proliferous in the axils, the larger lanceolate, attenuate, sparingly short-toothed, rarely over 3 cm. long and 6 mm. wide, contracted or gradually narrowed to a short scarcely winged petiolar portion; heads 12–14 mm. long, sessile or nearly so in small glomerules disposed in a flattish-topped terminal inflorescence; corollas very slender, with long tubular throat and short hispid-puberulous limb, white (Philippi) or purple (Baker); pappus of blunt erose scales (about 0.5 mm. long) alone or accompanied (in the adelphocarps) by 1–2 short awns (1–3 mm. in length) or by 3–5(–7) longer bristle-like scabrid awns about equalling the corolla.—Comp. Bot. Mag. ii. 251 (1837). *S. lanceolata* Hook. & Arn. Comp. Bot. Mag. i. 238 (1836), not Lag. *S. puberula* Don in mss. acc. to Hook. & Arn. l. c., not Hook. *S. tenuifolia* Phil. Anal. Univ. Chil. xxi. 397 (1862); Hieron. in Engl. Bot. Jahrb. xxii. 708 (1897). *S. Arnottiana* Bak. in Mart. Fl. Bras. vi. pt. 2, 201 (1876).

MENDOZA: Baths of Villavicenzio and Cienega de Ceorojas, *Gillies*, no. 165-1 (K., phot. Gr.); wood near San Bernardino, *Gillies* (Gr.); Portezuelo del Portillo, *W. Diez* [material distributed by and sometimes labelled as if collected by Philippi] (Brl., phot. Gr., Philippi Herb., phot. Gr.).
LA RIOJA: Sierra de Ulapes, *Stuckert*, no. 17,106 (Gen.).

The original material of the species, collected in the Andes of Mendoza by Dr. Gillies, though maintaining uniformity in other respects, shows such variability in the length, number or even in the presence or absence of its pappus-awns as to indicate that separation of *S. tenuifolia* or even varietal subdivision here on pappus alone would have little if any classificatory significance.

17. **S. cinerascens** Sch.-Bip. Upright perennial herb 3–6 dm. high, covered with short slender crisped white hairs on stem and foliage but in the openly paniculate inflorescence very shortly glandular-puberulent; stem terete, purple, fistulose, subsimple to the inflorescence or much branched above the middle; leaves opposite, sessile or nearly so by an attenuate base, lanceolate, narrowed to a mostly obtusish tip, crenate, of firm texture, 3-nerved; heads slender-pedicelled, 11–13 mm. long; phyllaries narrowly oblong, acute, dorsally white-villulose, the delicate hairs subappressed, incurved or crisped and glandless but with some sessile or barely stipitate glands sometimes present also; corollas about 5 mm. long, the lobes obtuse, ciliolate; achenes essentially homomorphous, each with 18–22 barbellate awns and no scales.—Sch.-Bip. acc. to Bak. in Mart. Fl. Bras. vi. pt. 2, 209 (1876); Hieron. in Engl. Bot. Jahrb. xxii. 738 (1897).

MISIONES: on the Cerro de Santa Ana, *Niederlein*, no. 418, acc. to Hieron. l. c.
[SOUTHERN BRAZIL.]

Although the writer does not find by his notes that he has ever personally seen Argentine material of this species, there seems no reason to doubt the entire accuracy of Hieronymus's report of its occurrence in Misiones. The foregoing description has been drawn from Brazilian specimens, largely from Schultz's type, namely *Sello*, no. 1949 (Par., Brl.).

18. **S. Lundiana** DC. Erect or suberect herbaceous perennial with slender leafy stem, simple at least to the middle; leaves opposite, closely sessile, erect, the cauline mostly exceeding the internodes, oblong-lanceolate, subacute, shallowly toothed on the distal third, veiny, thick, rigid in texture, 1.5–2.2 cm. long, 4–5 mm. wide, glabrous or near the margin slightly hispidulous; heads at first in a convex corymb but at maturity mostly long-pedicelled in an open panicle; phyllaries villulose (sometimes sparingly so) with glandless hairs and also beset with sessile glands; corollas dark purple with roseate limb; achenes homomorphous, each bearing about 13–14 slender dark awns.—Prod. v. 122 (1836); Bak. in Mart. Fl. Bras. vi. pt. 2, 209 (1876); Hieron. in Engl. Bot. Jahrb. xxii. 740 (1897).

Misiones: Campos de la Villa de Palmas, *Niederlein*, no. 1375, acc. to Hieronymus, l. c.
[Brazil.]

19. **S. multiaristata** Spreng. Perennial, erect or nearly so, 4–6 dm. high, covered on stem and leaves by soft weak subappressed or crisped white glandless hairs and on the inflorescences and phyllaries closely beset with short straight spreading stiffish gland-tipped hairs; stems very leafy to the inflorescence; internodes mostly less than 1 cm. long; leaves scattered, crowded, sessile, often proliferous in the axils, linear and quite entire or narrowly oblong-lanceolate and obscurely few-toothed toward the mostly acutish tip, 3–4 cm. long, 2–6 mm. wide; inflorescence repeatedly and rather irregularly forked; pedicels stiffish, much elongated; heads 11–14 mm. long; phyllaries linear-oblong, mucronate; corollas purple, with paler and densely puberulent limb; achenes homomorphous or nearly so; awns mostly 18–25, equalling the corolla; scales none.—Syst. iii. 449 (1826); DC. Prod. v. 124 (1836). *S. megapotamica* DC. l. c. 123. *S. laxa* Hook. & Arn. Comp. Bot. Mag. i. 238 (1836). *S. satureifolia* var. *multiaristata* (Spreng.) Bak. in Mart. Fl. Bras. vi. pt. 2, 208 (1876) and var. *laxa* (Hook. & Arn.) Bak. l. c. 209. *Pectis violacea* Griseb. Symb. 201 (1879). *S. violacea* (Griseb.) Hieron. in Ktze. Rev. Gen. iii. 180 (1898).

Entrerios: Concepcion del Uruguay, *Lorentz*, no. 590 (N. Y., phot. Gr.).
Buenos Aires: clay banks, Buenos Aires, *Tweedie*, no. 415 (Gr.); near

Estancia Orjeira in the Partida Pringles on the more elevated parts of the plains, *Osten*, no. 135, acc. to Hieron.

20. **S. entreriensis** Hieron. Perennial herb, leafy to the fastigiately branched glandular-puberulent inflorescences; leaves opposite or (the upper) alternate, sessile, oblong-oblanceolate, mostly obtuse, serrate except toward the gradually cuneate base, loosely ciliate on margin and nerves, otherwise glabrous and green on both surfaces, the largest 5.5 cm. long, 2.4 cm. wide; pedicels 4–15 mm. long; phyllaries lance-oblong, very acute, dorsally glandular-puberulent and sometimes also sparingly villous; corollas with purple throat and white or pink hispid limb; achenes uniform or nearly so, each bearing 18–23 stramineous awns about equalling the corolla; scales none.—Hieron. in Engl. Bot. Jahrb. xxii. 739 (1897).

ENTRERIOS: sparingly on the northern Medano (dune) near Concepcion del Uruguay, *Lorentz*, no. 952 (Brl., phot. Gr.).
MISIONES: in red gravel on plains, San Ignacio, *Chodat*, no. 373 (Univ. Gen.), a dwarfed and doubtful specimen.
FORMOSA: Laishi, March 1918, *Jörgensen*, no. 2910 pro parte (Gr., Mo.).
[PARAGUAY.]

A second collection (May 1919) distributed by Jörgensen under the same number (Gr.) shows a plant which may prove varietally separable on account of its recumbent habit and much longer apparently single stem. More complete material is needed to make clear the status of this puzzling plant.

21. **S. aristata** D. Don. Perennial herb, finely incurved-pubescent, 5–7 dm. high; stem single, erect from a shortly decumbent base, flexuous, leafy; leaves opposite, sessile by a cuneate base or the lower slender-petioled, rhombic-oblong, acute, rather finely serrate except on the abruptly or gradually narrowed petioliform base; the limb of the largest 4–7 cm. long, 1.3–3 cm. wide; panicle terminal, leafy-bracted, somewhat elongated; heads about 11 mm. long, sessile or short-pedicelled in small loose clusters terminating the flexuous spreading branches of the panicle; phyllaries loose, disposed to spread, narrowly lanceolate, attenuate, 7–8 mm. long, green, incurved-puberulent with glandless hairs; corollas yellowish white, puberulous; achenes uniform or nearly so, each bearing 15–20 awns; these stramineous, bristle-like, barbellate, slightly broadened at the base.—D. Don in Hook. & Arn. Comp. Bot. Mag. i. 238 (1836); Bak. in Mart. Fl. Bras. vi. pt. 2, 212 (1876), excl. syn.

BUENOS AIRES: in the pampas, *Gillies*, no. 162 in part (Gr., K., phot. Gr.).
ENTRERIOS: *Christie*, acc. to Bak. l. c.
TUCUMÁN: *Tweedie*, acc. to Bak. l. c.
[URUGUAY, PARAGUAY.]

22. **S. mercedensis** Hieron. Slender erect perennial herb 3–6.5 dm. high; stems mostly single but sometimes (especially in rejuvenation after injury by cutting or burning) 2–4, terete, pale green or more often purple, leafy; leaves opposite or in part alternate, sessile by a gradually narrowed base or the larger borne on short slender petioles, narrowly lanceolate to linear, obscurely and remotely toothed or quite entire, many of them proliferous in the axils, incurved-puberulent at least on the lower surface, the larger cauline 3–6 cm. long, 5–7 mm. wide, the rameal and sometimes even the cauline much smaller, linear, entire, scarcely 2 cm. long and 2 mm. wide; heads about 1 cm. long, subsessile in turbinate or campanulate terminal glomerules disposed in a flattish usually open leafy-bracted corymb; phyllaries lance-oblong, acute, about 6 mm. long; corollas with slender puberulent violet-purple throat and white or roseate limb; achenes (all exaristate in the exceptional var. γ.) normally heteromorphic, the adelphocarps usually 4, each bearing 7–13 bristle-like awns, the idiocarp exaristate or bearing 1–3 awns.—Hieron. in Engl. Bot. Jahrb. xxii. 735 (1897).

A species showing all degrees of transition between the extremes of its variable stature and leaf-breadth, but as to pubescence and pappus capable of subdivision as follows.

Key to the Varieties of S. mercedensis.

Phyllaries closely covered with short incurved glandless hairs and a few scattered sessile glands.....Var. α. *typica.*
Phyllaries beset with short stiffish spreading gland-tipped hairs.
Adelphocarps each bearing 7–13 bristle-like awns.....Var. β. *glanditecta.*
Achenes uniform, all exaristate.....Var. γ. *Pereyrae.*

Var. α. **typica.** Phyllaries pale green, covered with fine incurved white glandless hairs and sessile lucid glands. –Doubtless including some part of the material which has been traditionally referred to the overburdened *S. saturciaefolia,* but to be distinguished from that species by its smaller heads, broader leaves, its usually heteromorphic achenes, and smaller number of awns in the adelphocarps when these are aristate.

Catamarca: La Merced, *Lorentz & Hieronymus* (Brl., phot. Gr.).
Tucumán: on plains, Las Cejas, alt. 400 m., *Lillo,* no. 18,881 (Gr.); Las Cuchillas, alt. 1100 m., *Lillo,* no. 5368 (Gr.); Rio Chico, alt. 220 m., *Herb. of M. Lillo,* no. 14,992 (Gr.); in grass on plains, Ranchillos, alt. 400 m., *Lillo,* no. 14,986 (Gr.); Campo Alegre, alt. 350–400 m., *Schreiter,* nos. 2510 (Gr.), 2389 (Gr.), 4092 (Gr.), and 5736 (Gr.); Estación Aráoz, Dept. of Cruz Alta, alt. 450 m., *Schreiter,* no. 3992 (Gr.); Tacanas, Dept. of Cruz Alta, alt. 450 m., *Schreiter,* no. 5737 (Gr.); Tapia, Trancas, *Schreiter,* no. 295 (Gr.); Cadilla a

Tapia, alt. 600 m., *Schreiter*, no. 2081 (Gr.); in thin woods, El Pualites, Dept. Burruyaco, alt. 700 m., *Venturi*, no. 7353 (Gr., Mo.).

CORDOBA: sandy talus, Sierra Mica, *Lossen*, no. 202 (Gr., Mo.).

Var. β. **glanditecta** Robinson. Habit and foliage as in var. *typica* but phyllaries beset with short spreading gland-tipped hairs; pappus normal for the species, i. e. adelphocarps 8–12-awned and idiocarp 0–3-awned.—Contrib. Gray Herb. xc. 16 (1930).

TUCUMÁN: El Molle, Amaicha, *Castillon*, no. 3122 (Gr.); El Chorro a las Arcas, Dept. of Trancas, alt. 2200 m., *Schreiter*, no. 5688 (Gr.).

JUJUY: on mountain slopes at Tilcara, alt. 2600 m., 60 cm. high, with violet flowers, *Venturi*, no. 4868 (Gr.).

Var. γ. **Pereyrae** Robinson. Known only from renewal shoots sent up by mowed stocks, of low growth; stems densely leafy; leaves linear, the cauline mostly proliferous in the axils; achenes alike, all 5 crowned by stramineous scarious scales (0.5–0.7 mm. long); awns none.—Contrib. Gray Herb. xc. 16 (1930).

JUJUY: Guasamayo, Dept. of Tilcara, alt. 2470, *Pereyra*, no. 5823 (Gr.).

Exaristate varieties of pauciaristate species have been frequently observed but in this small plant alone has the writer found what appears to be an exaristate condition of a species normally multiaristate. Though very dwarf and narrower-leaved it approaches very closely in technical characters the Bolivian *S. cardiaca* Perkins, which, however, has the idiocarp merely hispid at the summit instead of scale-bearing. Much more copious material will be needed to show the significance of this very slight difference.

23. **S. satureiaefolia** (Lam.) Sch.-Bip. Erect essentially herbaceous perennial; root a dense cluster of long slender dark fibres; stems 1–many, slender and very leafy, 2–6 dm. high; leaves narrowly linear, obtusish, entire, the lowest opposite, the others alternate or scattered and often proliferous from the axils, grayish-puberulent at least on the lower surface, mostly 2–2.5 cm. long and 1–2(-3) mm. wide; heads 12–14 mm. long; phyllaries broadly linear, acute, about 8 mm. long; achenes ranging from almost homomorphic (each bearing 14–19 bristle-like awns about 8 mm. long and no scales) to distinctly heteromorphic (one achene in each head being differentiated as an idiocarp and bearing a pappus reduced to much fewer and shorter awns or to mere exaristate scales).—Linnaea, xxv. 291 (1853); Bak. in Mart. Fl. Bras. vi. pt. 2, 208 (1876) in part (as *satureifolia*); Hieron. in Engl. Bot. Jahrb. xxii. 736 (1897) in part (as *satureifolia*). *Eupatorium satureiaefolium* Lam. Encycl. ii. 411 (1786). *Mikania satureiaefolia* (Lam.) Willd. Sp. Pl. iii. 1747 (1804). *Nothites satureiaefolia*

(Lam.) DC. Prod. v. 186 (1836). *S. lincaris* Gillies acc. to Bak. l. c. in synon.

This, the earliest described of the multiaristate Stevias, has been variously placed and delimited. By Baker and by Hieronymus it was made to include longer-pedicelled, broader-leaved and more glandular-puberulent material with stiffer and more openly cymose inflorescence. With these inclusions the species became difficult to separate from forms even more remote from the Uruguayan plant on which it was based. Here it is again reduced to what appears to be a natural plant-entity with uniformity of habit and a fair degree of constancy in essential details, except for its manifestly variable pappus. Two of the varieties suggested by Hieronymus (*patagonica* and *maimarensis*) are here retained though known as yet from material too scanty to demonstrate their status. The tendencies may be defined as follows.

KEY TO THE VARIETIES OF S. SATUREIAEFOLIA.

Heads borne for the most part in few-headed terminal and subterminal fascicles disposed in flattish-topped corymbs...Var. *α. genuina.*
Heads tending to be aggregated in separate subglobose clusters.
Phyllaries incurved-puberulent.....Var. *β. patagonica.*
Phyllaries spreadingly glandular-puberulent.....Var. *γ. maimarensis.*

Var *α.* **genuina** Hieron. Heads in small few-headed corymbously disposed fascicles or glomerules; phyllaries clothed with rather dense short incurved glandless white hairs interspersed with yellow or orange sessile glands.—Hieron. in Engl. Bot. Jahrb. xxii. 736. *S. multiaristata* Griseb. Goett. Abh. xix. 166 [reprint 118] (1874), not Spreng.

BUENOS AIRES: near Puan, Sierra Pampeanas, *Lorentz*, no. 16 (Gr., N. Y.); Campana, *Parodi*, no. 8736 (Gr.); coast near Cape San Antonio, *Gibson* (Gr.).
CORDOBA: *Hieronymus* (U. S., N. Y.); *Kuntze* (N. Y., U. S.); Casa Grande, *Stuckert*, no. 19,911 (Gen.).
MENDOZA: *Gillies* (Gr.).
RIO NEGRO: North Patagonia, *Wilkes Exped.* (Gr., N. Y., U. S.).
SANTA CRUZ? "Patagon. 50/3°," *Moreno & Tonini*, nos. 570 (N. Y.) and 580 (N. Y.).
[URUGUAY.]

Var. *β.* **patagonica** Hieron. Less densely incurved-puberulent; heads more closely aggregated into somewhat larger capitate clusters; otherwise exceedingly similar to var. *genuina* and clearly passing into it.—Hieron. in Engl. Bot. Jahrb. xxii. 737 (1897).

BUENOS AIRES: in humus on slopes of river-bank near Carmen de Patagones, *Berg*, no. 120 (Brl., phot. Gr.); Tandil, *Kuntze* (U. S.).
CORDOBA: at foot of the Gigantes, *Hieronymus* (Brl.), *Galander* (Brl.); on

the Cuesta del Gaucho, *Hieronymus* (Brl.); El Rodeo de los Caballos at the sources of the Rio Tercero, *Hieronymus* (Brl.).

With this variety Hieronymus included, seemingly with some hesitation, a plant from the Sierra Achala which was habitally similar but which had fewer (11–14) awns. This the writer has not had opportunity to re-examine in the light of recent studies. It may well fall, in the present classification, with *S. mercedensis* rather than in *S. satureiaefolia* as here interpreted.

Var. γ. **maimarensis** Hieron. Heads in dense subglobose clusters; inflorescence and phyllaries beset chiefly with short straight gland-tipped hairs.—Hieron. in Engl. Bot. Jahrb. xxii. 737 (1897).

JUJUY: Maimará in the Quebrada de Humahuaca, *Lorentz & Hieronymus*, no. 738 (Brl., phot. Gr.).

This glandular-puberulent plant when known from more copious material may well prove specifically separable.

SPECIES AND VARIETIES REDUCED OR STILL DOUBTFUL.

S. achalensis Hieron. in Engl. Bot Jahrb. xxii. 712 (1897) = S. VAGA Griseb.

S. Arnottiana Bak. in Mart. Fl. Bras. vi. pt. 2, 201 (1876) = S. GILLIESII Hook. & Arn.

S. diversipapposa Hieron. l. c. 708, incl. forms *exaristata*, *breviaristata* and *longiaristata* = S. VAGA Griseb.

S. Gilliesii Griseb. Symb. 166 (1879) not Hook. & Arn. = S. VAGA Griseb.

S. Grisebachiana Hieron. l. c. 716 = S. ALPINA Griseb.

S. lanceolata Hook. & Arn. Comp. Bot. Mag. i. 238 (1836) = S. GILLIESII Hook. & Arn.

S. laxa Hook. & Arn. l. c. = S. MULTIARISTATA Spreng.

S. linearis Gillies acc. to Bak. l. c. 208 (1876) = S. SATUREIAEFOLIA (Lam.) Sch.-Bip.

S. Lorentzii Griseb. Goett. Abh. xix. 164 [by error numbered 416], reprint 117 (1874) = S. BREVIARISTATA Hook. & Arn.

S. megapotamica DC. Prod. v. 123 (1836) = S. MULTIARISTATA Spreng.

S. multiaristata Griseb. Goett. Abh. xix. 166 [reprint 118] (1874) not Spreng. = S. SATUREIAEFOLIA (Lam.) Sch.-Bip.

S. oxylaena var. *villosa* Sch.-Bip. acc. to Hieron. in Engl. Bot. Jahrb. xxii. 738. Under this name Hieronymus, l. c., reports specimens collected in Entrerios by Lorentz at Puerto de Brete (no. 1311), Palmar de Concordia (no. 673), and Palmar Grande (no. 658). With

no recent opportunity to examine any of these specimens, the writer is unable to define the precise application of the name as used by Hieronymus, who states that the plant was the same as *S. hirsuta* Griseb. Symb. 168 (1879) not Hook. & Arn. Griseb., l. c., described its heads as 3–5-nate and shortly pedicelled on the shortly racemiform panicle branches. According to the collector, the flowers were white. It happens that *S. oxylaena* DC. is merely a later name for the purple-flowered *S. Selloi* (Spreng.) Sch.-Bip., a species which in Brazil and Paraguay is apt to have the heads (when fully mature) rather long-pedicelled and disposed in an open panicle.

S. procumbens var. *tucumanensis* Hieron. l. c. 729 = S. VAGA Griseb.

S. puberula D. Don ex Hook. & Arn. Comp. Bot. Mag. i. 238 (1836) = S. GILLIESII Hook. & Arn.

S. pubigera Hieron. in Engl. Bot. Jahrb. xxii. 720 (1897), incl. var. *subglabrata* Hieron. l. c. = S. BREVIARISTATA Hook. & Arn.

S. saltensis Hieron. l. c. 725 (1897) = S. YACONENSIS var. SALTENSIS (Hieron.) Robinson.

S. satureifolia var. *multiaristata* and var. *laxa* Bak. in Mart. Fl. Bras. vi. pt. 2, 208 (1876) = S. MULTIARISTATA Spreng.

S. SATUREIFOLIA var. VATTUONEI Hicken, Darwiniana, i. 152 (1924). This has not been found in any herbarium examined by the writer. Its characters, so far as described, are somewhat perplexing, the pappus-awns being said to range from 3 to 5 and the stem to be beset with gland-tipped hairs. Without authentic material for study and comparison, it would be unwise to attempt any disposition of this interesting but still problematic plant. It seems rather unlikely that it will prove conspecific with *S. satureiaefolia* (Lam.) Sch.-Bip. as here interpreted and circumscribed.

S. Schultzii Hieron. l. c. 721 (1897), at least as to Argentine material, probably = S. BREVIARISTATA Hook. & Arn.

S. Veronicae var. *erythrochaeta* DC. Prod. v. 123 (1836). Hieronymus in Engl. Bot. Jahrb. xxii. 741 (1897) reports the occurrence of this variety in Misiones in open places of the Sierra de Santa Ana, *Niederlein*, no. 418. The writer has had no recent opportunity to examine this specimen. It is to be noted that Hieronymus, l. c. 738, cites the same number as *S. cinerascens* Sch.-Bip. *S. Veronicae* is perhaps only a later and hence untenable name for the composite species within which Baker included both the earlier species *S. tenuis* H. & A. and *S. gratioloides* H. & A. A clear and nomenclatorially correct disposition of the Misiones plant must await re-examination and a better knowledge of its Brazilian relatives.

S. violacea (Griseb.) Hieron. in Ktze. Rev. Gen. iii. 180 (1898) = S. MULTIARISTATA Spreng.

Numbered Exsiccatae of Argentine Stevias verified during the foregoing Revision.

Berg.

120 satureiaefolia v. patagonica Hieron.

Castillon

7 breviaristata H. & A.
8 effusa Hieron.
9 alpina Griseb.
652 vaga Griseb.
1143 yaconensis v. subeglandulosa Hieron.
2799 alpina Griseb.
3011 vaga Griseb.
3122 mercedensis v. glanditecta Robinson
3493 alpina Griseb.
5741 nevadensis Hieron.
5742 vaga Griseb.

Giacomelli

4767 effusa Hieron.

Gillies

162 (in part) aristata D. Don
165 Gilliesii H. & A.
165–1 Gilliesii H. & A.

Haussel

53 saturieaefolia (Lam.) Sch.-Bip.

Hieronymus & Lorentz

170 yaconensis v. saltensis (Hieron.) Robinson
175 procumbens Hieron.
226 effusa v. saltensis Hieron.
535 sanguinea Hieron.
539 yaconensis Hieron.

Hieronymus & Niederlein

426 vaga Griseb.

Jörgensen

1134 vaga Griseb.
1664 alpina Griseb.
2910 (in part) entreriensis Hieron.
2439 yaconensis v. subeglandulosa Hieron.
2690 vaga Griseb.
4353 breviaristata H. & A.
4366 alpina Griseb.
5368 mercedensis Hieron.
5634 Chamaedrys Griseb.
5747 breviaristata H. & A.
7553 breviaristata H. & A.
8088 potrerensis Hieron.
8103 yaconensis Hieron.
8117 breviaristata H. & A.
9667 potrerensis Hieron.
11,788 nevadensis Hieron.
14,979 breviaristata H. & A.
14,986 mercedensis Hieron.
15,923 effusa v. saltensis Hieron.
15,924 Lilloi Robinson
15,925 yaconensis Hieron.
18,870 breviaristata H. & A.
18,881 mercedensis Hieron.

King, D. O.

72 Gilliesii H. & A.

Lillo

91(B) breviaristata H. & A
1632 breviaristata H. & A.
1672 breviaristata H. & A.

Lillo (Herb. of)

4060 breviaristata H. & A.
11,225 yaconensis v. subeglandulosa Hieron.
14,992 mercedensis Hieron.

Lorentz

16 satureiaefolia (Lam.) Sch.-Bip.
153 vaga Griseb.
203 breviaristata H. & A.
420 minor Griseb.
590 multiaristata Spreng.
620 alpina Griseb.
667 vaga Griseb.
952 entreriensis Hieron.

Lorentz & Hieronymus

151 breviaristata H. & A.
171 Chamaedrys Griseb.
320 breviaristata H. & A.
324 breviaristata H. & A.
723 satureiaefolia v. maimarensis Hieron.

Lossen

202 mercedensis Hieron.
238 vaga Griseb.

Moreno & Tonini

570 satureiaefolia (Lam.) Sch.-Bip.

580 satureiaefolia (Lam.) Sch.-Bip.

Parodi

8054 breviaristata H. & A.
8736 satureiaefolia (Lam.) Sch.-Bip.

Pereyra

5823 mercedensis v. Pereyrae Robinson

Rodriguez

370 yaconensis v. subeglandulosa Hieron.
11,211 vaga Griseb.
11,253 breviaristata H. & A.
16,826 minor Griseb.

Schickendantz

146 Schickendantzii Hieron.
216 effusa Hieron.

Schreiter

295 mercedensis Hieron.
885 vaga Griseb.
1342 minor Griseb.
1345 vaga Griseb.
1603 yaconensis v. aristifera Robinson
1667 breviaristata H. & A.
2081 mercedensis Hieron.
2389 mercedensis Hieron.
2510 mercedensis Hieron.
2684 potrerensis Hieron.
2685 yaconensis v. aristifera Robinson
2979 vaga Griseb.
2980 vaga Griseb.
3637 Schreiteri Robinson
3992 mercedensis Hieron.
4092 mercedensis Hieron.
4158 alpina Griseb.
4159 effusa v. saltensis Hieron.
4236 Chamaedrys Griseb.
4257 Schickendantzii Hieron.
5688 mercedensis v. glanditecta Robinson
5733 effusa v. saltensis Hieron.
5736 mercedensis Hieron.
5737 mercedensis Hieron.
5738 effusa v. saltensis Hieron.
5739 breviaristata H. & A.
5740 effusa Hieron.

Stuckert

1786 vaga Griseb.
1907 vaga Griseb.
17,106 Gilliesii H. & A.
18,648 vaga Griseb.
19,911 satureiaefolia (Lam.) Sch.-Bip.

Tweedie

415 multiaristata Spreng.
1201 breviaristata H. & A.

Venturi

364 breviaristata H. & A.
3679 Fiebrigii v. gracillima Robinson.
4739 vaga Griseb.
4868 mercedensis v. glanditecta Robinson
5007 breviaristata H. & A.
6126 breviaristata H. & A.
6168 breviaristata H. & A.
7353 mercedensis Hieron.
8054 effusa Hieron.
8635 yaconensis v. aristifera Robinson
8707 yaconensis v. subeglandulosa Hieron.
8723 Chamaedrys Griseb.
8870 breviaristata H. & A.
9343 yaconensis v. subeglandulosa Hieron.

THE STEVIAS OF PARAGUAY.

Present day knowledge of the Paraguayan flora is chiefly due to the unwearied efforts of Dr. E. Hassler. During many years of residence in Paraguay he has explored much of the country personally, published repeatedly on its flora, and illustrated its plants by extensive and admirably prepared exsiccatae now distributed in the larger herbaria of the world. He also enlisted the collaboration of Professor Chodat in a series of papers dealing with the plants of Paraguay and at a

later date employed as custodian of his herbarium Mr. T. Rojas, who has ably explored very interesting mountainous regions in the northern parts of the country and secured important collections for the continuation of Dr. Hassler's notable exsiccatae.

Without underestimating the incidental value of earlier botanical work done in Paraguay by such men as Bonpland, Wright, Balansa, D. Parodi, Morong, Kuntze, Malme, and Anisits, there can be no doubt that Paraguayan botany entered a wholly new era when the collections of Hassler became available about the beginning of the present century. It is but natural that the first work done on these required later much revision, for it was subject to many difficulties and undertaken with no foreknowledge of the degree of endemism likely to be found in the Paraguayan flora. There was natural expectation of placing its plants successfully in the earlier known species of southern Brazil, the Argentine Republic and Uruguay. Thus several Paraguayan Stevias were referred to the Uruguayan and Argentine *S. satureiaefolia* (Lam.) Sch.-Bip. and some others to the Brazilian *S. polycephala* (Sch.-Bip.) Bak. Nor was it entirely possible to avoid the opposite error of taking for novelties Paraguayan plants subsequently identifiable with little known species of the adjacent countries, as in the case of *S. guaranitica* Chod., a plant quite inseparable from the Brazilian *S. leptophylla* Sch.-Bip.

In his later publications Dr. Hassler has cleared up many of these slips which had occurred in the early identification of his plants. Anxious not to multiply species unduly, yet wishing to place on record many minor differences, he attempted at times a classification running so far into the subspecific, varietal and formal categories as to prove scarcely practicable in a flora still so imperfectly known. In *Stevia*, however, this intensive classification was not tried and the five new species described or suggested by Hassler are admirably clear. The chief difficulty in arriving at the treatment here presented was not, as in the case of the Argentine Stevias, the evaluation of the species already described, for most of these could be pretty readily distinguished and keyed and the others with equal definiteness referred to synonymy. Much more puzzling was the question how far the number of the species should be increased to make proper provision for quite a number of specimens from the later collections of Hassler and Rojas, as well as those of Fiebrig and of Chodat—plants of intermediate appearance or doubtful status which have lain undetermined for many years in the larger herbaria of the world.

To cover these more doubtful elements in the Stevia flora of Paraguay it has seemed necessary to propose three new species, as well as

to put on published record *S. estrellensis* Hassl., a plant long ago distinguished and labelled but apparently never described. It is true that these new species are of a rather technical nature and rather less obvious than the Stevias hitherto described from Paraguay. However, they cannot be satisfactorily placed in any of these at present.

In this genus the endemism in Paraguay is striking, running to nine species out of fourteen, or more than 64 per cent. This high individuality of the Paraguayan Stevias is doubtless more apparent than real. It is likely that several of the species now seemingly endemic really extend beyond the boundaries of the country, though into regions as yet little explored.

Another remarkable peculiarity of the Paraguayan Stevias is that they are all of them multiaristate and all, so far as examined by the writer, have been found homocarpic, that is to say they all have pappus of Type VIII. However, to judge from the instability of pappus-character throughout the genus, exceptions to this rule are very likely to be found.

Key to the Paraguayan Species of Stevia.

a. Leaves ovate to suborbicular, sessile by a broadly obtuse to rounded base, small, rarely as much as 1.5 cm. long....*b.*
  b. Heads borne singly in a lax ovoid panicle; mature pedicels usually much exceeding the involucres....*c*
    c. Leaves glabrous, rounded at base, longer than the internodes, mostly erect or ascending; panicle-branches bearing several pairs of reduced leaves.....1. *S. parvifolia.*
    c. Leaves scabrous-puberulent above, whitish-pubescent beneath, subcordate, mostly about equalling the internodes and widely spreading; panicle-branches naked or with single pair of reduced leaves.....2. *S. amplexicaulis.*
  b. Heads borne in dense flattish-topped corymbs; pedicels for the most part shorter than the involucres.....3. *S. estrellensis.*
a. Leaves rhombic-ovate, ovate-oblong, or rarely (in no. 4) lance-oblong, the main cauline mostly 2–7 cm. long....*d.*
  d. Main cauline leaves sessile and without a contracted petioliform base....*e.*
    e. Leaves hairy beneath on the surface as well as the nerves ....*f.*
      f. Stem (branching at close of first season's growth) spreading-villous, the hairs long, white, jointed; inflorescence rather densely corymbose.....4. *S. Balansae.*
      f. Stem (virgate up to the inflorescence) finely incurved-puberulent; inflorescence much looser, the partial cymes for the most part only 2–5-flowered and disposed in corymbose panicles.....5. *S. amambayensis.*
    e. Leaves glabrous beneath except on the nerves .....6. *S. apensis.*
  d. Main cauline leaves distinctly petioled or the leafblade conspicuously contracted below into a petioliform base....*g.*
    g. Expanded portion of the leafblade not much longer than wide....*h.*

h. Heads slender-pedicelled in a rather dense flattish corymb; leaves finely glandular-puberulent, the nerves and veins much paler than the surface.....7. *S. cuneata.*
h. Heads subsessile in small fascicles; these disposed in an open panicle; leaves coarsely villous, their nerves and veins darker than the surface.....8. *S. Rojasii.*
g. Expanded portion of heafblade more than twice as long as wide.....9. *S. aristata.*
a. Leaves oblanceolate or rarely lanceolate....*i.*
i. Pedicels and phyllaries finely and spreadingly glandular-puberulent.....10. *S. entreriensis.*
i. Pedicels and phyllaries incurved-puberulent or very finely villous with short glandless hairs....*j*
j. Leaves with no saccharine taste, the main cauline 7–8 cm. long.....11. *S. ammotropha.*
j. Leaves with pronounced saccharine taste, the main cauline rarely over 3 cm. long.....12. *S. Rebaudiana.*
a. Leaves narrowly oblong to linear....*k.*
k. Leaves setiferous at least on the margin, clearly toothed; plant 3–7 dm. high.....13. *S. Selloi.*
k. Leaves glabrous, entire; plant mostly 1.5–2.5 dm. high.14. *S. leptophylla.*

1. **S. parvifolia** Hassl. Erect herbaceous perennial 3–6 dm. high; stem solitary, simple to the inflorescence, enveloped by the ascending and imbricated foliage; leaves opposite, sessile, ovate, acute, serrate from the middle, rounded at base, subcoriaceous, glabrous, the largest about 1.5 cm. long and 1 cm. wide; panicle terminal, its branches slender, ascending, flexuous, usually bearing 1–several pairs of oblong or lanceolate much reduced leaves (5 mm. long, 1 mm. wide); heads about 9 mm. long, on filiform pedicels at maturity 1–1.5 cm. in length; phyllaries oblong, subacute, 3-nerved, hirtellous; corolla with short proper tube, dark purple cylindrical throat, and white lobes; achenes homomorphic, each bearing 12–15 barbellate awns (5 mm. in length).—Hassl. in Fedde, Rep. Spec. Nov. xi. 165 (1912).

NORTHERN PARAGUAY: in dry gravel, Estrella, *Rojas*, no. 9979 (Herb. Hassler, Brl.).

This species, compared by its author to *S. Lundiana* DC., seems much closer to *S. alternifolia* Hieron., a Brazilian plant of strikingly similar habit though differing in its alternate and pubescent leaves as well as its more numerous pappus-awns.

2. **S. amplexicaulis** Hassl. Erect leafy-stemmed perennial herb 8–15 dm. high; leaves opposite, sessile by a subcordate and semi-amplexicaul or subtruncate base, deltoid-ovate, obtuse or acutish, crenate, of firm texture, 1.5–2 cm. long, 1–2.2 cm. wide (about equalling the internodes), covered on both surfaces with short spreading pointed glandless hairs; branches of the panicle spreading-ascending, bearing a few remote and much reduced ovate to oblong opposite or

alternate leaves passing to lanceolate bracts; heads 9.5 mm. long, on pedicels at maturity 1–2 cm. in length; phyllaries oblong, acute, with prominent midrib and several obscure lateral nerves, incurved-puberulent and beset with sessile and short-stiped glands; corollas hispid-puberulent, with long slender deep purple throat and whitish limb; achenes (still immature) about 3 mm. long, similar, each bearing 14–19 barbellate purple awns 4.5 mm. in length.—Hassl. in Fedde, Rep. Spec. Nov. xi. 165 (1912).

NORTHERN PARAGUAY: on sandy plains near Estrella, Sierra de Amambay, *Rojas,* nos. 10,111 (herb. Hassler, phot. Gr., BM., Brl.) and 10,111a (Brl.).

3. **S. estrellensis** Hassl. in herb. Erect perennial herb 4–8 dm. high, dividing somewhat above the base into 2–4 virgate leafy branches; leaves opposite, sessile, spreading, broadly ovate to suborbicular, obtuse to rounded at each end, crenate above the middle, entire toward the base, finely pubescent on both surfaces, paler and somewhat reticulated beneath, the largest about 2 cm. long and wide, about equalling the internodes; heads 1 cm. long, subsessile or on pedicels sometimes as long as the involucre, clustered near the ends of ascending branches and together forming a rather dense flattish-topped or moderately convex corymb; phyllaries oblong, short-pointed, somewhat mucronate, softly villulose, about 8 mm. long; corollas puberulent, white; achenes nearly uniform, each crowned with 16–20 slender stramineous barbellate awns (5 mm. long).

NORTHERN PARAGUAY: on sandy plains, near Estrella, Sierra de Amambay, Feb. 1908, *Rojas,* no. 10,196 (herb. Hassler, phot. Gr., Brl.).

The writer has sought in vain for any published description of this species. As it is now many years since it was designated by an herbarium name and as it appears to be clearly distinct, it seems eminently worthy of printed record, thus adding another to the now very extended series of Paraguayan novelties discovered by Dr. Hassler and by the Custodian of his herbarium, Mr. Rojas.

4. **S. Balansae** Hieron. Suffrutescent, 0.2–1 m. high, drying a slightly ochraceous or rufescent brown; stem lignescent, simple apparently during the first season then dividing into several upright branches, softly spreading-pubescent; leaves opposite (except a few of the uppermost), sessile, ovate to ovate-oblong, acutish, serrate except near the mostly rounded base, the largest about 3.5 cm. long, 2 cm. wide, softly pubescent on both surfaces, 3-nerved from the base; corymbs terminal, flattish or moderately convex, fastigiately branched, rather dense; pedicels often equalling or slightly exceeding the invol-

ucre; phyllaries linear-oblong, acute, pale green to ochraceous brown, finely glandular-puberulent and often softly spreading-hirtellous; corollas white; achenes nearly uniform, 17–20-aristate.—Hieron. in Engl. Bot. Jahrb. xxii. 739 (1897). *S. saturiaefolia* Morong & Britton, Ann. N. Y. Acad. Sci. vii. 135 (1892), not Sch.-Bip. *S. Hassleriana* Chod. Bull. Herb. Boiss. ser. 2, ii. 305 (1902), iii. 704 (1903).

Central Paraguay: on uncultivated hills, Asuncion, *Balansa*, no. 753 (Brl., BM.), *Morong*, no. 107a (Gr., N. Y., U. S.); border of woods near Atira, *Hassler*, no. 1368 (acc. to Chodat); in region of the Tapiraguay River, *Hassler* no. 5955 (Gr., Univ. Gen.); in region of Lake Ypacaray, *Hassler*, nos. 11,564 (Gr., Brl.) and 12,158 (Gr., Brl.); lomas above Acahay, *Chodat*, no. 402 (Univ. Gen.); Cordillera de Altos, *Hassler*, no. 3854 (Gr.), *Fiebrig*, no. 962 (Brl., Arn. Arb., phot. Gr.); in the vicinity of Caaguazu, *Hassler*, nos. 3854 (Brl.), 9342 (Brl.), 9342a (Gr., BM., Brl.) and 9342b (Brl.).

Northern Paraguay: among rocks on the upper part of the Apa River, *Hassler*, no. 7822 (Univ. Gen.); edge of woods in moist shade between the rivers Apa and Aquidaban, *Fiebrig*, nos. 4474 = 4756 (Gr., K., BM., Brl.).

5. **S. amambayensis** Robinson. Erect herbaceous or suffrutescent perennial about 5 dm. high, pale and slightly rufescent after drying; stem incurved-puberulent, leafy to the inflorescence; leaves opposite, sessile, subrhombic-obovate, obtuse or acutish, crenulate except toward the cuneately narrowed base, 1.5–3 cm. long, 1–1.5 cm. wide, firmly membranaceous, very shortly puberulent above, scarcely paler, incurved-puberulent and punctate beneath, 3-nerved from a point above the base, loosely reticulated; inflorescence loose, many-branched; bracts foliaceous but much reduced; heads about 8 mm. long, shortly pedicelled in 3–5-headed terminal glomerules; phyllaries lance-oblong, acute, very finely grayish-villulose and beset with sessile glands; corollas probably pink or purplish with white limb; achenes alike, 1.5 mm. long (scarcely mature), each bearing 14–17 awns (about 4.5 mm. long).—Contrib. Gray Herb. xc. 6 (1930).

Northern Paraguay: on plateau and slopes of the Sierra de Amambay, *Rojas*, no. 10,111b (Brit. Mus., Brl., phot. Gr.).

6. **S. apensis** Robinson. Erect, herbaceous or suffrutescent, about 1 m. high, branched above; stem dark purple, finely incurved-puberulent; leaves opposite, sessile, narrowly rhombic, crenate-serrate from the middle to the obtuse apex, entire and cuneate toward the base, 2.5–4.3 cm. long, 6–10 mm. wide, prominently 3-nerved, firmly membranaceous, above glabrous or sparingly hirtellous near the edge, below paler, glabrous on the surface but beset on the nerves with very short spreading hairs; panicle convex or subpyramidal, leafy-bracted, the partial cymes dense; pedicels 0–3.5 mm. long; phyllaries green, lance-linear, acute, 7–8 mm. long, beset with short spreading

glandless white bristle-like hairs; corollas probably reddish-purple; achenes alike, 2.6 mm. long, nigrescent, sparingly sprinkled with minute glands; pappus-awns 13–19, straw-colored, 4–4.5 mm. long.—Contrib. Gray Herb. xc. 7 (1930).

NORTHERN PARAGUAY: in calcareous region of the upper Apa River, *Hassler*, no. 11,079 (Univ. Gen., phot. Gr.).

7. **S. cuneata** Hassl. Strict perennial herb 4–8 dm. high; stem covered with spreading gland-tipped hairs, leafy to the middle, then bearing 2 or more pairs of somewhat remote and much reduced foliaceous bracts; leaves opposite, broadly ovate, obtuse, incisely crenate, abruptly contracted at base into an entire cuneately winged petiolar portion, scabrid above, hirsutulous on nerves and veins beneath, the largest 4.5 cm. long and 4 cm. wide; corymb terminal, fastigiately branched, flattish-topped, rather dense; pedicels 5–10 mm. long, densely glandular-puberulent; heads 1 cm. long; phyllaries linear-lanceolate, acute, glandular-puberulent, 7 mm. long; corollas with purple throat and broad ovate round-tipped white teeth; achenes practically homomorphous, each bearing 15–17 awns (5.5 mm. long).—Hassl. in Fedde, Rep. Spec. Nov. xi. 166 (1912).

NORTHERN PARAGUAY: in tall grass on the plains near Estrella, *Rojas*, no. 10,286 (herb. Hassler, phot. Gr., Brl.).

A well marked species. Dr. Hassler records leaves of considerably greater size than any seen by the writer while examining the type-collection.

8. **S. Rojasii** Hassl. Suffruticose, 0.5–1 m. high; stem virgate, erect, densely leafy to the inflorescence, clothed with loosely spreading white hairs; leaves opposite, broadly ovate, obtuse, crenate, except on the cuneately narrowed petiolar portion, the blade 3–5 cm. long, more than half as wide, sparingly crisped-puberulent on both surfaces, thinly membranaceous, rufescent in drying; heads about 1 cm. long, short-pedicelled in small dense glomerules terminating the branches of a rather open panicle; phyllaries oblong, shortly pointed, 5–7-nerved, dorsally covered with rather long tapering white hairs; corollas said to be white; achenes practically uniform, each bearing 14–15 awns.—Hassl. in Fedde, Rep. Spec. Nov. xi. 167 (1912).

NORTHERN PARAGUAY: on dry plains in the Sierra Amambay near Estrella, *Rojas*, no. 10,185 (herb. Hassl., phot. Gr., Brl.); also in similar habitat at Punta Pará, *Rojas*, no. 10,375 (Brl.).

9. **S. aristata** D. Don. For description see p. 72. *Dissothrix Hassleriana* Chod. Bull. Herb. Boiss. ser. 2, i. 411 (1901). *S. Balansae*

Chod. l. c. ser. 2, ii. 306 (1902) in part (i. e. as to *Balansa*, no. 754) not Hieron.

In Paraguay not only is typical material of this species frequent but there appears to be a second variety present in some abundance, the distinctions being as follows:

Var. α. **typica.** Leaves mostly 4–6 cm. long and 1–2 cm. wide; pedicels and phyllaries covered with incurved white glandless hairs interspersed with a few lucid sessile glands.—Contrib. Gray Herb. xc. 8 (1930).

Northern Paraguay: dry plains at Villa Lana between the Apa and Aquidaban Rivers, *Fiebrig*, no. 5174 (Gr., Brl.); in the region of the Alto Paraná River, *Fiebrig*, no. 6002 (Gr., Brl., Gen., BM.); on plateau and slopes of Sierra de Amambay, *Rojas*, nos. 10,219 (Gen., Brl.) and 10,511 (Brl., Univ. Gen., BM.).

Central Paraguay: in the region of Lake Ypacaray, *Hassler*, no. 12,611 (Gr., Copenh.); plains about Caaguazú, *Balansa*, no. 754 (Univ. Gen., BM., phot. Gr., *Hassler*, nos. 9033 (BM., Brl.), 9033a (Gr., Brl.)).

[Argentina, Uruguay.]

Var. β. **villaricensis** Robinson. Leaves, even the main cauline, smaller, 2–3 cm. long, 7–10 mm. wide; pedicels and phyllaries finely and densely beset with gland-tipped hairs with or without some glandless pubescence.—Contrib. Gray Herb. xc. 8 (1930).

Central Paraguay: very common on plains, Villa Rica, *Jörgensen*, no. 4267 (Gr.).

10. **S. entreriensis** Hieron. For description see p. 72—Hieron. in Engl. Bot. Jahrb. xxii. 739 (1897); Chod. & Hassl. Bull. Herb. Boiss. ser. 2, iii. 704 (1903).

As to luxuriance, specimens of this species may be usually divided as follows:

Var. α. **typica** (Hieron.). Main stem-leaves mostly 4–6 cm. long and 1–2.2 cm. wide, their margins usually toothed from near the apex to the middle of the leaf or even somewhat below it; phyllaries 7–8 mm. long.—*S. entreriensis* forma *typica* Hieron. l. c.

Northern Paraguay: in moist clayey soil, near Concepcion, *Hassler*, nos. 7419 (Gr.) and 7419a (Gr.); Santo Elisa in the Gran Chaco, *Rojas*, no. 2642 (Gr., Univ. Gen.).

[Argentina.]

Var. β. **minor** Hieron. Leaves more narrowly oblanceolate, even the main cauline normally 3–4 cm. long and 8–10 mm. wide, their margins seldom toothed below the upper third of the leaf; heads slightly smaller, the phyllaries mostly 5–6 mm. long.—Hieron. in Engl. Bot. Jahrb. xxii. 739 (1897); Chod. & Hassl. Bull. Herb. Boiss. ser. 2, iii. 704 (1903).

NORTHERN PARAGUAY: on dry plains in borders of woods, Caballero-Cué between the Rivers Apa and Aquidaban, *Fiebrig*, no. 4810 (Gr., K., BM., Gen.), on the plateau and slopes of the Sierra de Amambay, *Rojas*, no. 10,771 (Univ. Gen.); in sandy places near Arroyo Primero on the upper part of the Rio Apa, *Hassler*, no. 3812 (Gr.).

CENTRAL PARAGUAY: in the region of Lake Ypacaray, *Hassler*, nos. 11,595 (Gr.) and 12,571 (Gr.); on plains, Tacuaral, *Hassler*, no. 3812 (Gr.); in the neighborhood of Caaguazú, *Hassler*, no. 9267 (Gr.).

SOUTHERN PARAGUAY: *Kuntze* (N. Y., phot. Gr.).

[ARGENTINE REPUBLIC.]

11. **S. ammotropha** Robinson. Suffruticose 5–15 dm. high, finely crisped-puberulent with glandless hairs; stem round, reddish-brown, hollow at the center; leaves opposite, lanceolate, remotely and bluntly serrate, subsessile by an attenuate entire base, membranaceous, green on both sides, finely incurved-puberulent, 5–7 cm. long, 6–10 mm. wide; inflorescence (when well developed) a pyramidal panicle; heads about 8.5–9 mm. long, short-pedicelled in fastigiate corymbs terminating the branches; pedicels incurved-puberulent; phyllaries lanceolate, green, villulose; corollas white, granulated, the limb hirtellous; achenes subuniform, 15–21-awned, the body 2.5 mm. long, sprinkled with scattered sessile glands; awns 5 mm. long, stramineous or violet-tinged.—Contrib. Gray Herb. xc. 7 (1930).

CENTRAL PARAGUAY: sandy places on stream banks near Caaguazú, *Hassler*, no. 9347 (Gr., Univ. Gen., BM.).

12. **S. Rebaudiana** (Bertoni) Hemsl. Suffruticose, erect, obscurely puberulent, 3–4.5 dm. high; leaves opposite, sessile, lance-oblong to spatulate-oblanceolate, obtuse, serrate above the middle, entire on the cuneately narrowed base, of chartaceous or subcoriaceous texture, 3-nerved and conspicuously veiny, the cauline 3–5 cm. long, 7–15 mm. wide, often proliferous in the axils; inflorescence becoming rather loosely paniculate, the heads (on pedicels often about as long as the involucre) appearing opposite the bracts in irregular sympodial cymes; corollas with pale purple throat and white limb; achenes nearly uniform, 15–17-aristate.—Hemsl. in Hook. Ic. Pl. xxix. pl. 2816 (1906); Turrill, Kew Bull. 1918, p. 343–345 (1918). *Eupatorium Rebaudianum* Bertoni, Bol. Escuel. Agric. Asunc. ii. 35 (1899).

NORTHERN PARAGUAY: highlands of Amambay and northward to the sources of the Rio Monday, *Bertoni, Gosling* (Gr.).

This is the "Sweet Herb of Paraguay." Its leaves, even after drying, possess a singularly lasting sweet taste. The plant in consequence has been the subject of experimental cultures at Kew, at the Agricultural Station in Barbados, the Harvard Botanic Garden in Cuba, and doubtless at many other places. Although it is said to

be quite free from noxious effects, no satisfactory methods have thus far been devised for its use as a sweetening agent in foods, preserves, etc. The plant, however, still remains a promising subject for further research and experimentation along these lines.

13. **S. Selloi** Spreng. Slender upright perennial herb 15–90 cm. high, simple to the inflorescence or ascendingly branched from below the middle; stem terete, dark red, very leafy; leaves sessile, opposite or above scattered, narrowly lance-oblong to linear, acutish, shallowly and sometimes sparingly serrate above the middle, 1–4 cm. long 2–4 mm. wide, inclining to become firm in texture and at least after drying olivaceous to reddish-brown in color, sparingly but often rather coarsely ciliate on nerves and margins with attenuate white jointed hairs; inflorescence (at first dense) when well developed a loose panicle; mature pedicels filiform 1–2 cm. long; phyllaries narrowly lance-oblong, acute, 5–6 mm. long; corollas white or at least as to the cylindrical throat reddish-purple; achenes similar, each of them 12–20-awned.—Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 209 (1876). *Kleinia Selloi* Spreng. iii. 438 (1826). *S. oxylaena* DC. Prod. v. 123 (1836).

Of this species two varieties may be distinguished, as follows:

Var. α. **typica**. Stem-leaves lanceolate or oblanceolate to narrowly oblong; pedicels and phyllaries covered with subappressed jointed white glandless hairs.—*S. satureifolia* Chod. Bull. Herb. Boiss. ser. 2, ii. 306 (1902) at least in part, also ibid. ser. 2, iii. 704 (1903), not Sch.-Bip.

Central Paraguay: on plains near the Carimbatay River, *Hassler*, no. 4568 (Gr., BM.); in gravelly places near Valenzuela, *Hassler*, no. 6975 (BM., Univ. Gen.); near Caaguazú, *Hassler*, no. 9098 (Gr., Brl., Univ. Gen.).
[Southern Brazil, Uruguay.]

Var. β. **ypacarayensis** Robinson. Leaves slightly narrower, even the cauline lance-linear, 2–3 mm. wide; pedicels and phyllaries minutely glandular-puberulent, with very few if any of the long white glandless hairs.—Contrib. Gray Herb. xc. 20 (1930). *S. satureifolia* Chod. Bull. Herb. Boiss. ser. 2, ii. 306 (1902) in part, not Sch.-Bip.

Central Paraguay: on plains, Cordillera de Altos, *Hassler*, no. 3910 (Gr., BM., Brl.); in the region of Lake Ypacaray, *Hassler*, no. 12,154 (Gr., U. S.).

It should be stated that the Paraguayan plant here treated as var. *typica* differs in some slight and presumably formal respects from the original Brazilian material of the species in which the leaves seem slightly firmer, broader in relation to their length, more rubescent in the dried state, and less clearly punctate. Correspondence in all other respects seems to be very close.

14. **S. leptophylla** Sch.-Bip. Very slender upright perennial herb, sometimes flowering at 8 cm. but occasionally reaching a height of 40 cm.; stem very leafy, mostly simple to the end of the first season's growth then developing from near the summit 3–12 ascending branches; internodes 1–5(–10) mm. long; leaves filiform, sessile, the lowest opposite, the others usually scattered, 4–23 mm. long, 0.4–0.8 mm. wide, glabrous, entire, rounded at tip, green and punctate on both surfaces; pedicels filiform, 4–15 mm. long; heads 6–9 mm. long, subsolitary at the ends of the branches in low weak plants or in more luxuriant specimens paniculately disposed; phyllaries green or dark purple; corollas white; achenes nearly alike, each bearing 7–11 usually violet-tinged awns.—Sch.-Bip. ex Bak. in Mart. Fl. Bras. vi. pt. 2, 205 (1876). *S. guaranitica* Chod. Bull. Herb. Boiss. ser. 2, iii. 704 (1903).

Central Paraguay: in the region of the upper Y-acá River, *Hassler*, no. 6617 (Univ. Gen., Arn. Arb., fragm. Gr.); south of Tobatí, *Fiebrig*, no. 844 (Gr.).

[Southern Brazil.]

Transferred Species.

S. guaranitica Chod. Bull. Herb. Boiss. ser. 2, iii. 704 (1903) = *S.* leptophylla Sch.-Bip.

S. Hassleriana Chod. Bull. Herb. Boiss. ser. 2, ii. 305 (1902), iii. 704 (1903) = S. Balansae Hieron.

S. polycephala Hieron. in Engl. Bot. Jahrb. xxii. 735 (1897) not Bak. = as to *Balansa*, no. 754, S. aristata D. Don.

S. satureifolia Chod. Bull. Herb. Boiss. ser. 2, ii. 306 (1902) not *S. satureiaefolia* (Lam.) Sch.-Bip. = S. Selloi (Spreng.) Sch.-Bip.

S. saturiaefolia Morong & Britton, Ann. N. Y. Acad. Sci. vii. 135 (1892), not *S. saturieaefolia* (Lam.) Sch.-Bip. = S. Balansae Hieron.

Numbered Exsiccatae of Paraguayan Stevias verified during the foregoing Revision

Balansa

753 Balansae Hieron.
754 aristata D. Don

Balch

4755 Rebaudiana (Bertoni) Hemsl.

Chodat

373 entreriensis Hieron.
402 Balansae Hieron.

Fiebrig

844 leptophylla Sch.-Bip.
962 Balansae Hieron.
4474 Balansae Hieron.
4756 Balansae Hieron.
4810 entreriensis v. minor Hieron.
5174 aristata D. Don
6002 aristata D. Don

Hassler

1034 entreriensis v. minor Hieron.
1368 Balansae Hieron.
3812 entreriensis v. minor Hieron.
3854 Balansae Hieron.
3910 Selloi v. ypacarayensis Robinson

4568 Selloi (Spreng.) Sch.-Bip.
5955 Balansae Hieron.
6547 entreriensis v. minor Hieron.
6617 leptophylla Sch.-Bip.
6975 Selloi (Spreng.) Sch.-Bip.
7419 entreriensis Hieron.
7419a entreriensis Hieron.
7822 Balansae Hieron.
8428 entreriensis v. minor Hieron.
9033 aristata D. Don
9033a aristata D. Don
9098 Selloi (Spreng.) Sch.-Bip.
9342 Balansae Hieron.
9342a Balansae Hieron.
9342b Balansae Hieron.
9347 ammotropha Robinson
11,079 apensis Robinson
11,564 Balansae Hieron.
11,591 entreriensis v. minor Hieron.
12,154 Selloi v. ypacarayensis Robinson
12,158 Balansae Hieron.
12,158a Balansae Hieron.
12,571 entreriensis v. minor Hieron.
12,611 aristata D. Don

Haussel

42 Selloi (Spreng.) Sch.-Bip.

Jack

5148 Rebaudiana (Bertoni) Hemsl.

Jörgensen

4267 aristata v. villaricensis Robinson

Morong

107a Balansae Hieron.

Rojas

2642 entreriensis Hieron.
9979 parvifolia Hassl.
10,111 amplexicaulis Hassl.
10,111a amplexicaulis Hassl.
10,111b amambayensis Robinson
10,112 aristata D. Don
10,112a aristata D. Don
10,185 Rojasii Hassl.
10,196 estrellensis Hassl.
10,219 aristata D. Don
10,286 cuneata Hassl.
10,286a cuneata Hassl.
10,375 Rojasii Hassl.
10,511 aristata D. Don
10,771 entreriensis v. minor Hieron.

THE STEVIAS OF NORTH AMERICA.

In its North American occurrence *Stevia* extends, chiefly in the uplands, from southern Arizona to Costa Rica, being specially diversified and developing strong endemism in Mexico, where the species are numerous, undoubtedly more so than for any region of similar extent in South America. As pointed out in the introductory observations, they are also intricate in nature and have been much confused in literature.

The species of *Stevia* which occur in the United States are neither abundant nor characteristic. They are clearly the northernmost outpost-stations of plants which have their major development in Mexico, the country presumably of their origin. Similarly the species in Central America are few and exhibit little local differentiation. For the most part they form merely the intermediate stations for species of wide latitudinal range which pass from Mexico far into South America. The few Central American species which are not of this transitional nature may be regarded as southern extensions of the Mexican types.

The best recent work on the Stevias of any part of the North

American continent is that of Dr. S. F. Blake, who in Standley's admirable Trees and Shrubs of Mexico (Contrib. U. S. Nat. Herb. xxiii. 1424–9) has keyed and described the woody species of Mexico. With Dr. Blake's conclusions the writer finds himself in substantial agreement, though material now at hand suggests some additions and minor emendments. It is to be wished that the herbaceous species permitted equally clear treatment.

For convenience the North American Stevias may be divided into pretty readily recognizable groups, as follows:

Key to Groups

Inflorescence lax, the pedicels mostly equalling and often much exceeding the involucre.....Ser. I. Podocephalae.
Inflorescence or its component parts denser; heads sessile or on pedicels averaging much shorter than the involucre.Ser. II. Corymbosae.
Distinctly shrubby, at least toward the base....Subser. 1. Fruticosae.
Essentially herbaceous.....Subser. 2. Herbaceae.

The artificial nature of these, by no means mutually exclusive, groups being understood and some cross-reference permitted, they yield means of first division among species which if taken together would require a key of somewhat tedious length and complexity.

Ser. I. PODOCEPHALAE Sch.-Bip. Mature pedicels for the most part equalling or exceeding the involucre; inflorescence ranging from very diffuse ovoid panicles to flattish-topped compound corymbs with heads subcontiguous but rather long-pedicelled.—Linnaea, xxv. 270 (1853).

Key to the North American Stevias of Ser. Podocephalae

a. Leaves deeply parted, the segments usually linear, often again lobed or toothed.....1. *S. trifida.*
a. Leaves neither deeply parted nor strongly lobed....*b.*
b. Annuals....*c.*
c. Corolla (distinctly shorter than the pappus-awns) with minute inconspicuous subregular limb, its lobes about 0.5 mm. long.....2. *S. micrantha.*
c. Corolla (about equalling or somewhat exceeding pappus-awns if present) with well developed zygomorphic limb, the lobes 1–2.5 mm. long....*d.*
d. Corolla-throat dark purple; outer corolla-lobes about 2.5 mm. long; inflorescence glandular-puberulent.3. *S. Aschenborniana.*
d. Corolla-throat greenish-white, the outer corolla-lobes 1–1.4 mm. long; inflorescence obscurely puberulent but not glandular.....4. *S. milopoda.*
b. Perennials, herbaceous or nearly so....*e.*
e. Leaves ovate or rarely oblong, usually one-third to two-thirds as wide as long....*f.*

f. Leaves glabrous or at most rather obscurely appressed-pubescent. . . .*g*.
g. Leaves entirely glabrous; the upper subsessile, nearly or quite as long as the internodes; blades of the lower oblong.....5. *S. orizabensis*.
g. Leaves inconspicuously appressed-pubescent, the upper slender-petioled, much shorter than the internodes; blades of the lower deltoid- or broadly rhombic-ovate.....6. *S. micradenia*.
f. Leaves copiously and often coarsely spreading-pubescent to tomentose....*h*.
h. Conspicuously decumbent, leafy only near the base. 7. *S. Liebmannii*.
h. Erect or nearly so, leafy to the inflorescence....*i*.
i. Leaves (including petiole if present) 3–7 cm. long; petiole when developed slender at least toward base....*j*.
j. Heads 10–12 mm. long, loosely panicled; florets nearly twice as long as involucre.....8. *S. elatior*.
j. Heads 8–9 mm. long, subcorymbously aggregated at ends of panicle-branches; florets once and half as long as involucre.....9. *S. Lehmannii*.
i. Leaves (including petiole) 10–12 cm. long; petiole winged to base.....10. *S. alatipes*.
e. Leaves narrowly lanceolate or oblanceolate to linear, rarely one-fourth as wide as long....*k*.
k. Pappus-scales (as distinguished from the awns) if present minute, rarely 0.5 mm. long.....11. *S. viscida*.
k. Pappus-scales conspicuous, 1–1.5 mm. long....*l*.
l. Heads 5-flowered; pappus coroniform; inflorescence finely white-puberulent, scarcely or not at all glandular.....12. *S. Pringlei*.
l. Heads 7-flowered; pappus of both scales and awns; inflorescence densely glandular-puberulent....13. *S. simulans*.

1. **S. trifida** Lag. Slender and diffusely branched annual or short-lived perennial, erect or decumbent, 2–6 dm. high; stem puberulent, purple; leaves opposite, 3–several-cleft, 2–4.5 cm. long; segments 1–3 mm. wide; the uppermost leaves reduced, subsimple, often alternate; heads in an open compound cyme; phyllaries acute, spreading-puberulent, about 6 mm. long; corolla-throat purple; limb white, subregular, about 1.5 mm. long; achenes alike, 3-aristate; awns equalling the corolla; scales obsolete.—Gen. et Spec. Nov. 27 (1816); Sch.-Bip. Linnaea, xxv. 268 (1853). *S. microphylla* HBK. Nov. Gen. et Spec. iv. 140 (1820). *S. multifida* DC. and var. *trifida* (Lag.) DC. Prod. v. 121 (1836).—Moist rocky places, Central and Western Mexico.

MEXICO: Sonora: Alamos, *Palmer* ('90) no. 287 (Gr., K.), a form with lower leaves less deeply cleft; *Rose, Standley & Russell*, no. 13,108 (Gr., U. S.). Sinaloa: San Ignacio-Balboa, *Ortega*, no. 5068 (Gr., K.). Durango: Chacala, *Goldman*, no. 351 (Gr.). San Luis Potosi: *Virlet d'Aoust* (Par.). Guanajuato: dried bed of Atotoniquillo River near Leon, *Hartweg*, no. 1607 (K., Par., Gen.). Jalisco: rocky banks, Guadalajara, *Pringle*, no. 1832 (Gr., K.,

BM., Gen., Univ. Gen.); *Palmer* ('86) no. 95 (Gr., Univ. Gen.). COLIMA: *Palmer* ('91) no. 1158 (Gr., K., BM., Gen.). MICHOACAN: Rincon near Morelia, *Arsène* (Gr.). MICHOACAN or GUERRERO: Monte Sta. Ignesa, 1500 m., where called "manzanilla del agua" and used in infusion to treat dysentery, *Langlassé*, no. 33 (Gr., K.); on eastern slopes of cordillera, *Langlassé*, no. 861 (Gr., K., U. S.). GUERRERO: Tasco, *Humboldt & Bonpland*, no. 3963 (Par., phot. Gr., same unnumbered Brl.). STATE UNKNOWN: *Pavon*, no. 260 (Gen.); *Seemann*, no. 1989 (K., same unnumbered Gr.).

A species readily distinguished by its deeply parted leaves. A varietal separation of trifid and multifid forms has not been found feasible. *S. microphylla* HBK. appears to be a mere state in which secondary somewhat smaller and simpler leaves have been put forth after the primary ones had been largely destroyed, probably by drought.

2. **S. micrantha** Lag. Erect or nearly so, 7–70 cm. high, subsimple or more often branching almost from the base, puberulent; leaves opposite or the upper alternate, petiolate, ovate, crenate-serrate except toward the rather abruptly contracted base, thin, green on both surfaces, 1.5–4 cm. long, 1–3 cm. wide, sparingly pubescent chiefly on the veins; inflorescence compound, mostly elongated, leafy-bracted, its branches rather short, erect or ascending, many-headed; heads about 7.5 mm. long; phyllaries linear-oblong, obtuse or acute, glandular-puberulent; corollas about 4.4 mm. long, conspicuously surpassed by the awns; limb regular or nearly so, scarcely over 0.5 mm. in length; achenes anisocarpic, the adelphocarps 4, (2–)3-awned, the idiocarp coronulate with connate scales and sometimes 1 or more scarcely longer bristles.—"*Elench. H. R. M. ann.* 1805" ex Lag. Gen. et Spec. Nov. 27 (1816); DC. Prod. v. 121 (1836); Sch.-Bip. Linnaea, xxv. 269 (1853); Gray in Torr. Bot. Mex. Bound. 73 (1859); A. DC. Calq. d. Dess. t. 548 (1874); Hemsl. Biol. Cent.-Am. Bot. ii. 87 (1881); Gray, Syn. Fl. i. pt. 2, 91 (1884). *S. tenella* Moc. ex DC. l. c. *S. macella* Gray, Pl. Wright. ii. 70 (1853).—Rocky places and gravelly soil, chiefly in mountainous regions, southwestern New Mexico and southern Arizona to southern central Mexico.

UNITED STATES: NEW MEXICO: on shaded rocky cliffs of Copper Mine Creek, *Wright*, no. 1130 (Gr., K.); *Mex. Bound. Surv.* no. 454 (K.); Mineral Creek, Sierra Co., in moist places, *Metcalfe*, no. 1412 (Gr.); Ft. Bayard Watershed, Grant Co., *Blumer*, no. 128 (Gr).; Pinos Altos Mts., *Greene* (K., Par.). ARIZONA: *Lemmon*, nos. 320 (Gr., Univ. Gen.) and 321 (Gr.); about Portal, Cochise Co., *Eggleston*, no. 10,998 (Gr.); in gravelly soil, Mule Mts., *Goodding*, no. 927 (Gr.).

MEXICO: CHIHUAHUA: under damp cliffs near Chihuahua, *Pringle*, no. 742 (Gr., K., BM., Par.); southwestern Chihuahua, *Palmer* ('85) no. 284 (Gr.); shaded ledges, Sierra Madre, *Pringle*, no. 1258 (K., Univ. Gen.). COAHUILA: Sierra de la Paila, *Purpus*, no. 4721 (Gr., BM.). DURANGO: near the city, *Palmer* ('96) no. 746 (Gr., K.). NAYARIT: red soil on trail from Yxtlan to

Juanacata, alt. 1200 m., *Mexia*, no. 897 (Gr.). San Luis Potosi: in sandy places near the city, *Schaffner*, no. 240 (Gr., Par.) = 682 (Par., BM.) of the Vigener distrib.; *Parry & Palmer*, no. 328 (Gr., K., BM., Par., Univ. Gen.). Hidalgo: Regla, *Ehrenberg*, no. 482 (Gr.); hills near Tula, alt. 2075 m., *Pringle*, no. 9977 (Gr., K.). Puebla: Cholula, *Deam* (Gr.), *Arsène*, no. 495a (U. S.). Federal Dist.: Chapultepec, *Bilimek*, no. 505 (Gr., Par.), *Schaffner*, no. 190 (Par.); Valley of Mexico, *Aschenborn*, no. 109 (Par.), *Schmitz*, no. 70 (BM.), *Schaffner*, no. 241 (Par.), near Guadalupe, *Bourgeau*, no. 1069 (Gr., K., BM., Par., Gen.); Churubusco, *Orcutt*, no. 4293 (BM.); open places, Tlalpam, *Seler*, no. 4108 (Gr.). Michoacan: Tzintzantzan, *Seler*, no. 1219 (Gr.); Coronilla near Morelia, *Arsène* (Gr.). State unknown: *Ehrenberg*, no. 798 (Par.); *Schumann*, no. 47 (BM.); *Orcutt*, no. 4306 (K.); *Berlandier*, no. 877 (BM.); Volcano of Orizaba, *Schaffner*, no. 91 (Par.); Akalsingo, *Bilimek*, no. 503 (Par.).

A plant of characteristic habit, readily recognized in the genus by its minute corolla, which is distinctly shorter than the awns.

3. **S. Aschenborniana** Sch.-Bip. Erect annual, usually 3–5 dm. high, paniculately branched almost from the base, minutely glandular-puberulent; leaves (except the reduced upper ones) opposite, ovate, petiolate, crenate-serrate, acutish to acuminate, membranaceous, green and sparingly appressed-pubescent above, scarcely paler and slightly villous on the nerves beneath, 2.5–5.5 cm. long, 1.5–4.2 cm. wide; petiole 5–22 mm. long; cymes numerous, loose and irregular, together forming an elongated leafy-bracted panicle; pedicels filiform, when mature usually 10–12 mm. long; heads 9 mm. long; phyllaries 5 mm. long, acute or acutish, glandular-puberulent or more rarely incurved-puberulent with glandless hairs, mostly green shading to dark purple at tip; corolla tube and throat dark purple; limb relatively large, white or nearly so, bilabiate, of 2 smaller inner suberect lobes (about 1.5 mm. long) and 3 larger outer spreading lobes (2.5 mm. long); achenes anisocarpic; adelphocarps 4, triaristate; idiocarp crowned with short rounded and toothed scales.—Linnaea, xxv. 269 (1853); Hemsl. l. c. *S. podocephala* Schauer, Linnaea, xix. 718 (1847), not DC. *S. diffusa* Greenman, Proc. Am. Acad. xxxii. 307 (1897). *S. Claussenii* var. *boliviensis* Volkens, Bull. Herb. Boiss. ser. 2, vi. 848 (155), not Hieron.—Calcareous ledges and lava beds, southern central Mexico.

MEXICO: Morelos: lava beds above Cuernavaca, 1500–2300 m., *Pringle*, nos. 6608, 9120, 9975 (in various herbaria). Guerrero: mountain slope near Taxmalac, *Seler*, no. 4255 (Gr.). Oaxaca: lime rock of cañon below Cuauhtlilla, *Seler*, no. 1515 (Gr., K., Brl.). State unknown: *Aschenborn*, no. 652 (Par.).

Easily distinguished by its bilabiate corollas and annual root. Of restricted range and probably fugacious, therefore rarely collected.

4. **S. mitopoda** Robinson. Delicate, presumably annual, diffusely branched, 4 dm. or more in height; stem very slender, usually flexuous, obscurely puberulent; leaves opposite or nearly so except in the

inflorescence, the lower caducous, the upper lanceolate, subsessile, narrowed to an entire base and apex, serrate at the sides, 2–3.5 cm. long, 6–9 mm. wide; panicle very diffuse, obscurely puberulent but not glanduliferous; pedicels 1–1.8 cm. long; heads often nodding, 5–6 mm. long; phyllaries narrowly lanceolate, acute, green, minutely hairy but the pubescence not gland-tipped; corollas bilabiate, as in the preceding species but smaller, the lobes of the lower lip only 1–1.4 mm. long; throat greenish white; achenes anisocarpic, all crowned by short toothed blunt scales, but only about 3 of them bearing also 1–2 purple awns each.—Contrib. Gray Herb. lxxx. 8 (1928).—In rocky places, southwestern Mexico.

MEXICO: GUERRERO: on sunny rocky slopes, Rio Balsas, *C. & E. Seler*, no. 4286 (Brl., phot. & fragm. Gr.).

The most diffuse of the annual species; probably of quick development and fugacious.

5. **S. orizabensis** Robinson. Slender, nearly or quite herbaceous perennial, almost glabrous except for the diffusely branched and finely glandular-puberulent inflorescence; stems terete, purple, leafy to or even into the panicle; leaves opposite, thin, green and glabrous on both surfaces, not dark-punctate, 5–8.5 cm. long, 1–3.5 cm. wide, acuminate to (mostly) acute or rarely blunt, the lower rhombic-ovate and slender-petioled, serrate, the middle and upper oblong-lanceolate, more often entire or nearly so, narrowed to a subsessile base; bracts ovate-lanceolate or elliptical, gradually reduced upward, entire, often alternate; pedicels 4–6 mm. long, heads about 1 cm. long, often nodding; phyllaries linear-lanceolate, acute, green, glandular-puberulent; corolla-throat pale, greenish or yellowish white; limb white; achenes alike, crowned with a scarious cupule of more or less connate toothed scales about 0.2 mm. long.—Contrib. Gray Herb. lxxx. 10 (1928). *S. laxa* Robinson & Seaton, Proc. Am. Acad. xxviii. 107 (1893) in part (solely as to pl. of Bourgeau) but not as to type.

MEXICO: region of Orizaba: *Botteri*, no. 1125 (BM., K.); Escamilla, *Bourgeau*, no. 3331 (TYPE, Gr., K.).

A species in many respects close to the following, but having the (really glabrous) leaves more evenly distributed on the stem, the upper internodes less elongated, the upper (relatively narrower) leaves subsessile, and the inflorescence more copiously bracteate.

6. **S. micradenia** Robinson. Slender erect or more often decumbent herbaceous perennial, subglabrous except for the panicle; stem dark brownish purple, leafy chiefly toward the base, the upper internodes much elongated (9–13 cm. long); leaves opposite, ovate, obtuse

(or the upper acute), slender-petioled, crenate-serrate, obsoletely appressed-hirtellous (especially near the margin) on the upper surface and slightly so on the nerves beneath; inflorescence an open ovoid panicle, closely dotted with minute scarcely stiped dark glands; corolla limb white, the throat yellowish or greenish white; achenes alike, crowned by toothed blunt more or less connate scales about 0.3 mm. long.—Contrib. Gray Herb. n. s. lxiv. 3 (1922). *S. laxa* Robinson & Seaton, Proc. Am. Acad. xxvii. 108 (1893) as to type (Pringle), not Hook. & Arn.

MEXICO: Michoacan: dry hills in woods, Patzcuaro, *Pringle*, nos. 5051 (Gr.) and 4543 (Gr., K., BM.); lava fields near Uruapan, alt. 1830 m., *Pringle*, no. 13,571 (Gr.); Cerro Azul near Morelia, *Arsène* (Gr., Par.).

7. **S. Liebmannii** Sch.-Bip. Markedly decumbent, perennial, herbaceous, 2.5–6 dm. high, leafy only toward the base, the upper internodes becoming 1–1.5 dm. long; leaves deltoid-ovate to ovate-oblong, crenate-serrate, mostly obtuse, entire at the abruptly contracted base, rather coarsely pubescent chiefly on nerves and veins but more rarely subglabrous; petioles about 1 cm. long; panicle subcorymbous, with ascending branches; pedicels 5–20 mm. long, finely glandular-tomentellous; heads mostly 11–14 mm. long; achenes unlike; the (mostly 3) adelphocarps bearing 3–4 long awns as well as a scale-pappus, the (usually 2) idiocarps crowned by a scale-pappus only.

Key to Varieties.

Corolla deep purple or violet; heads mostly 12–14 mm. long. Var. α. *typica.*
Corolla limb white; throat greenish white; heads 10–11 mm. long.
Var. β. *chiapensis.*

Var. α. **typica**. Corolla a rich purple or the throat violet; heads at full maturity often 13–14 mm. long.—*S. Liebmannii* Sch.-Bip. ex Klatt, Leopoldina, xx. 75 (1884); Robinson, Proc. Am. Acad. xxxv. 326 (1900). *S. elatior* var. ? *decumbens* Rob. & Greenm. Am. Jour. Sci. ser. 3, l. 152 (1895). *S. decumbens* (Rob. & Greenm.) Greene, Pittonia, iii. 32 (1896).

MEXICO: Puebla: between San Andres and San Miguel, *Liebmann*, no. 125 (Copenh., where renumbered 8807, sk. and small fragm. ex Klatt hb. in Gr.). Oaxaca: dry hills near city of Oaxaca, alt. 1830 m., *Pringle*, no. 4974 (Gr., Par., BM., K.).

Var. β. **chiapensis** Robinson. Corolla limb white or nearly so, the throat greenish white; heads perceptibly smaller, the phyllaries green. —Contrib. Gray Herb. xc. 14 (1930).

MEXICO: Chiapas: Hacienda Monserrate, *Purpus*, no. 9100 (Gr.).

A species in essentials very close to and likely to intergrade with the following.

8. **S. elatior** HBK. Erect or slightly decumbent perennial herb, 3–9 dm. high; pubescence (usually copious) of spreading unequal white hairs, tipped with small dark globular glands; stem single, simple or more rarely branched, leafy to the base of the open obovoid or often obconical inflorescence; leaves opposite, broadly deltoid-ovate to ovate-oblong, elliptical or even obovate, obtuse, crenate-serrate, 2.5–5 cm. long, 1.8–3 cm. wide, membranaceous, rather coarsely pubescent on both surfaces, entire at the usually rather abruptly contracted base; pedicels 8–15 mm. long, glandular-puberulent; heads mostly 11–12 mm. long; phyllaries green or violet-tinged, acute, glandular-puberulent.

KEY TO VARIETIES.

a. Awns several, present in the pappus of at least 3 florets in each head, nearly as long as the corollas. . . . *b.*
  b. Middle and upper leaves sessile or subsessile (occasionally even clasping), the lower also sessile or raised on petioles rarely over 1 cm. long. . . . . Var. *α. typica.*
  b. Even the upper leaves petioled, the middle ones on petioles 2–3 cm. long. . . . . Var. *β. podophylla.*
a. Awns wholly absent or found (usually solitary) in only a part of the heads of an inflorescence. . . . . Var. *γ. dissoluta.*

Var. *α.* **typica.** Achenes normally diverse; adelphocarps (mostly 4) each bearing 3–5 long awns as well as scales; the idiocarp mostly with scale-pappus only; the achenes more rarely similar and all bearing awns in subequal number; the leaves (at least the middle and upper) sessile or nearly so.—*S. elatior* HBK. Nov. Gen. et Spec. iv. 144 (1820); Spreng. Syst. iii. 448 (1826); DC. Prod. v. 120 (1836); Sch.-Bip. Linnaea, xxv. 270 (1853); Hemsl. Biol. Cent.-Am. Bot. ii. 85 (1881), excl. ref. to Peru. ? *S. enarthotricha* Lag. Gen. et Spec. Nov. 27 (1816), a doubtful plant, described as having leaves acute at both ends and a glabrous involucre. ? *S. adenophora* Lag. l. c., also a problematic plant, said (probably erroneously) to have come from Chile and to have a villous involucre. *S. podocephala* DC. Prod. v. 121 (1836). *S. trichopoda* Harv. & Gray, Pl. Fendl. (Mem. Am. Acad. n. ser. iv.) 64 (1849). *S. sessilifolia* Willd. and *S. rhombifolia* Willd. (not HBK.) acc. to Sch.-Bip. l. c. ? *S. enarthrotricha* Sch.-Bip., a mere orthographic correction of Lagasca's name of doubtful application. *S. bicrenata* Klatt in Engl. Bot. Jahrb. viii. 32 (1886), the heads in Lehmann's Guatemalan plant being 5-flowered not 4-flowered as stated by Klatt.—A species apparently common at many points in its range

from central Mexico to northern Venezuela and central Ecuador, but curiously unknown from much of Central America.

MEXICO: from San Luis Potosi to Oaxaca.
CENTRAL AMERICA: mountains of Guatemala.
[COLOMBIA: from El Cauca to Santa Marta.]
[VENEZUELA: mountains of the western and northern parts.]
[ECUADOR: dry hills about Quito.]

Var. β. **podophylla** Robinson. Stem-leaves petiolate, the petioles often 2–3 cm. long; leaf-blades sometimes subtruncate or even subcordate at base and as much as 4 cm. wide; otherwise closely similar to the preceding variety.—Contrib. Gray Herb. xc. 13 (1930).

MEXICO: PUEBLA: Agua Fria near San Luis Tultitlanapa, *Purpus*, no. 3132 (TYPE, Gr., BM., U. S.); Tres Mogotes, alt. 2100–2450 m., *Purpus*, no. 3840 (Gr., BM., U. S.).

Var. γ. **dissoluta** (Schlecht.) Robinson. Habit closely as in var. *typica*, but pappus of all or nearly all the achenes merely a crown of scales; awns if present mostly solitary and occurring in only a few of the many heads of an inflorescence.—Contrib. Gray Herb. xc. 13 (1930). *S. dissoluta* Schlecht. Hort. Hallens. 16 (1841).—A plant doubtfully and as it appears incorrectly referred by Schultz to his *S. elatior* var. *coronata* (which, being founded on Funck's no. 317, was the species later separated by Hieronymus as *S. Wageneri*).

MEXICO: between Trojes and the Hacienda de la Trinidad, *Schiede*.

Not certainly known to the writer. A fragmentary specimen collected in Mexico by Baites (K.) corresponds well with Schlechtendal's description and, presumably representing the plant he was characterizing, appears to be as here interpreted only an awnless variety of *S. elatior*.

9. **S. Lehmannii** Hieron. Erect somewhat hirsute perennial herb, 5–6 dm. high, with habit and foliage much as in *S. elatior*, but with smaller heads (8–9 mm. high) subcorymbously aggregated at the ends of the stem and branches instead of more openly paniculate; many of the pedicels shorter than the phyllaries but some equalling or surpassing them; corollas white or pale rose; achenes alike, crowned by a short dentate cup about 0.4 mm. high.—Hieron. in Engl. Bot. Jahrb. xxviii. 562 (1901).

MEXICO: MICHOACAN or GUERRERO: in clayey soil, Los Llanos, *Langlassé*, no. 1065 (K., U. S.).
[COLOMBIA: open bushy places near Popayan, alt. 1700–2400 m., *Lehmann*, no. 5199 (Gr., Brl., phot. Gr.); El Saladito above Cali, alt. 1600 m., *Pittier*, no. 750 (U. S.).]

The Mexican (rather immature) specimens of Langlassé are of

lower stature but in essentials agree pretty closely with the original material from Colombia.

10. **S. alatipes** Robinson. Erect hirsute perennial herb, 1 m. or more in height; pubescence of white articulated often crisped hairs, gland-tipped only in the inflorescence; stem simple to the rather remotely branched panicle; leaves opposite, chiefly subbasal, large for the genus, obovate-oblong or broadly subspatulate, coarsely crenate, rounded at apex, green and pubescent on both surfaces, the blade 7–8 cm. long, 5 cm. wide, tapering below into a winged petiole 3–4 cm. long; heads 12–13 mm. long, clustered at the tips of long slender ascending panicle-branches; lower pedicels (at maturity) often 1 cm. long, the upper very short; phyllaries green, beset with spreading attenuate and articulated whitish hairs and sessile glands; corollas white or nearly so; achenes unlike; adelphocarps (4) bearing each a scale-pappus and 3–4 long awns; the idiocarp provided only with a scale-pappus (0.7 mm. long).—Proc. Am. Acad. xliii. 28 (1907).—Known only from the type-collection.

MEXICO: MICHOACAN: pine forests, Uruapan, alt. 1680 m., *Pringle*, no. 10,124 (Gr., Conserv. Gen., Par., BM., K.).

11. **S. viscida** HBK. Erect, 5–9 dm. high, glandular-viscid above; stem grayish-pubescent below, leafy throughout; leaves chiefly alternate, copiously proliferous in the axils, linear to oblanceolate or narrowly oblong, often conduplicate, entire or serrate toward the tip or from below the middle to the often obtusish apex, gradually narrowed to a mostly sessile base, 3-nerved, 2.5–5 cm. long, 4–10(–20) mm. wide; inflorescence varying from a moderately convex compound corymb to an ovoid panicle; heads loosely disposed on filiform pedicels (at least in part) equalling the involucre or often subglomerate toward the tips of the long spreading-ascending panicle-branches and borne on abbreviated pedicels; heads 14–15 mm. long; phyllaries mostly purple-tinged, densely glandular-puberulent; achenes alike, each crowned with short (sometimes obsolete) scales and 5 long dark purple perceptibly barbellate awns.—Nov. Gen. et Spec. iv. 140, t. 351 (1820). *S. purpurea* (*quinquearistata*) Lag. "*Elench. H. R. M. anno.* 1805" ex Lag. Gen. et Spec. Nov. 26 (1816), not Pers. *S. hyssopifolia* HBK. l. c. *S. laxiflora* DC. Prod. v. 122 (1836); Sch.-Bip. Linnaea, xxv. 283 (1853). *Ageratum purpureum* Sesse ex DC. l. c., in synon. *S. leuconeura* DC. l. c. 121 (1836). Presumably *S. viscosa* Hort. ex Steud. Nom. ed. 2, ii. 642 (1841), nomen nudum. *S. amabilis* Lemmon ex Gray, Proc. Am. Acad. xix. 1 (1883); Syn. Fl. i. pt. 2, 91 (1884). *S. Lozanoi* Robinson, Proc. Am. Acad. xliii. 28 (1907), the form with heads aggregated at tips of branches.

UNITED STATES: Southern Arizona: near Cave Canyon, *Lemmon*, no. 2729 (Gr.).
MEXICO: dry grassy places, mostly in or near the mountains, apparently frequent and locally abundant, Chihuahua to Oaxaca.

A species varying conspicuously (but without correlation of characters) in the degree of its glandularity, corolla-color (deep purple to rose or the limb even white), length of pedicels and consequent diffuseness of inflorescence, leaf-breadth, prominence or conspicuous paleness of midnerve, presence or absence of an obsolescent scale-pappus, etc., without however falling into well marked varieties.

Somewhat anisocarpic specimens (e. g. Pringle's no. 11,836 from Hidalgo and Goldman's no. 112 from Parral, Chihuahua) are sometimes found, in which one or two of the achenes have fewer awns than the others. Coulter's no. 282 from Bolaños appears to be an exaristate form of this species.

12. **S. Pringlei** Wats. Erect perennial, nearly or quite herbaceous, 3–5 dm. high, subsimple or more often branched almost from the base; stem brown to purple, hirtellous below, incurved-puberulent above, very leafy throughout; leaves scattered, chiefly lance-linear, entire, of firm texture, 2.2–3.7 cm. long, 2–4(–7) mm. wide, acutish, 3-nerved, glabrous, closely sessile, the earliest shorter, broader and much blunter; corymbs terminal, flattish, mostly 4–6 cm. in diameter; lower pedicels often 1–2.5 cm. long; heads erect, about 13 mm. long; phyllaries lanceolate, acute, purple-tinged, ciliolate; corollas rose-colored; achenes alike, crowned by a deep scarious denticulate cup of connate scales (0.9–1.2 mm. high).—Proc. Am. Acad. xxiii. 276 (1888).

MEXICO: Chihuahua: foothills of the Sierra Madre, *Pringle*, nos. 1301 (Gr., K.), 1617 (BM.); at base of Mt. Mohinora, alt. 2100–2300 m., *E. W. Nelson*, no. 4859 (Gr.); near Colonia Garcia, *E. W. Nelson*, no. 6204 (Gr.), *Townsend & Barber*, no. 249 (Gr., Par., BM., K.).

13. **S. simulans** Robinson. In habit and foliage closely resembling the preceding, but clearly differing in its larger heads, copiously glandular-puberulent pedicels and phyllaries; achenes uniform, each crowned by 5 long awns as well as a scale-pappus.—Proc. Am. Acad. xlii. 34 (1906).

MEXICO: Chihuahua: road from Parral to Batopsis, *Goldman*, no. 161 (Gr.). Durango: Mesa de Sandia, alt. 2750 m., *Pringle*, no. 10,144 (Gr., Univ. Gen., Par., BM., K.).

This species is exceptional in having the heads about 7-flowered, while elsewhere throughout the genus they are normally 5-flowered.

Ser. II. CORYMBOSAE Sch.-Bip. Heads densely aggregated into a single terminal usually corymbous inflorescence or at the tips of the branches of a compound corymb or panicle; pedicels normally much shorter than the involucre, often none. Pappus-awns present or absent, but not exceeding 6 in number.—Linnaea, xxv. 273, 284.

Subser. I. FRUTICOSAE. Distinctly shrubby plants of branched habit, or ligneous only near the base.

KEY TO THE NORTH AMERICAN STEVIAS OF SUBSER. FRUTICOSAE.

a. Leaves sessile or at base gradually narrowed to petioles rarely over one-sixth as long as the blade....*b.*
b. Leaves pubescent to tomentose or lanate at least along the midrib beneath....*c.*
c. Heads small, 5–7(–9) mm. long....*d.*
d. Leaves oval, rounded at tip, canescent-tomentose on both faces, 2–2.5 cm. long; achenes awned.....14. *S. tephrophylla.*
d. Leaves rhombic-ovate, green above, 4–9 cm. long; achenes often exaristate and merely coronulate. Here may be sought frutescent forms of.....54. *S. rhombifolia.*
c. Heads larger, 9–14 mm. long....*e.*
e. Phyllaries covered by a dense spreading grayish hispid puberulence; leaves oblong, entire or nearly so..15. *S. Lemmoni.*
e. Phyllaries gland-sprinkled to sparingly arachnoid-woolly....*f.*
f. Leaves linear-lanceolate, 7–8 times as long as wide, when young conspicuously revolute at margin..16. *S. revoluta.*
f. Leaves ovate-lanceolate or lance-oblong, mostly 3–5 times as long as wide, slightly thickened but not clearly revolute at margin....*g.*
g. Cauline leaves 1.5 dm. long, with spreading teeth; Guatemala.....17. *S. polycephala.*
g. Cauline leaves mostly 4–7 cm. long, entire or shallowly crenate....*h.*
h. Leaves (somewhat fleshy) at maturity reflexed, truly pinnate-veined.....18. *S. Seleriana.*
h. Leaves normally erect or ascending, more or less 3-nerved near the base....*i.*
i. Leaves membranaceous or nearly so, their veinlets scarcely or not at all exserted; phyllaries thinnish, usually somewhat striate-costulate, contracted to an acute or more often obtusish tip.....19. *S. subpubescens.*
i. Leaves thickish, somewhat rigid, their veinlets distinctly exserted beneath; phyllaries rigidulous, rounded dorsally, not striate, gradually narrowed to a sharp point.....20. *S. dictyophylla.*
b. Leaves entirely glabrous or at most obscurely hirtellous....*j.*
j. Leaves coriaceous, reticulated on both surfaces, 2–4 cm. wide....*k.*
k. Corymbs of congested glomerules; heads closely sessile ....*l.*
l. Involucre subglabrous; leaves lanceolate, lightly reticulated; lateral veins leaving midnerve at an angle of about 60°.....21. *S. Nelsonii.*

l. Involucre rather densely hispid-puberulent; leaves lance-oblong, strongly reticulated; lateral veins leaving midnerve at an angle of less than 30°.....22. *S. phlebophylla.*
k. Corymbs less congested; heads perceptibly pedicellate; leaves broadly ovate.....23. *S. scabrella.*
j. Leaves thickish, subcoriaceous, oblong, 2–3 cm. wide, not reticulated.....18. *S. Seleriana.*
j. Leaves thickish, subcoriaceous, narrowly oblong, 7–15 mm. wide, not prominently reticulated....*m.*
m. Leaves finely serrate, mostly 2–3 cm. long; awn-pappus normally present.....24. *S. vernicosa.*
m. Leaves entire, mostly 4–7 cm. long; pappus coronulate and exaristate.....25. *S. flourensioides.*
j. Leaves membranaceous or nearly so.....*n.*
n. Leaves perceptibly paler beneath, the cauline mostly 1.5–2.5 cm. wide; phyllaries dull or sprinkled with minute separate glands; pappus exaristate.....19. *S. subpubescens.*
n. Leaves concolorous, bright green on both sides, 2–12 (–15) mm. wide; phyllaries usually somewhat vernicose; pappus-awns mostly present.....26. *S. salicifolia.*
a. Leaves on well marked petioles (one-fifth to half the length of the blade)....*o.*
o. Glutinous and vernicose on the involucres and young foliage. 27. *S. lucida.*
o. Not vernicose, though sometimes glandular and viscid....*p.*
p. Blades of cauline leaves more than half as wide as long, on petioles a third to half their length....*q.*
q. Awn-pappus present; leaves subcoriaceous, much paler beneath.....28. *S. pyrolaefolia.*
q. Achenes merely coronulate; leaves membranaceous or nearly so....*r.*
r. Leaf-blades suborbicular-ovate, rounded at tip, crenate.....29. *S. Berlandieri.*
r. Leaf-blades ovate-oblong, pointed at tip, serrate.30. *S. glandulosa.*
p. Blades of the cauline leaves over thrice as long as wide, on petioles rarely above a quarter their length....*s.*
s. Stem shortly incurved-puberulent; leaves ovate-oblong; corymb much divided, 8–22 cm. wide.....31. *S. jaliscensis.*
s. Stem at first covered with loose white flocculent wool; leaves oblong; corymb small, dense, 4–5 cm. in diameter.....18. *S. Seleriana.*

14. **S. tephrophylla** Blake. Closely branched, leafy, canescent-tomentose, fruticose, 2–3 dm. high; leaves opposite, often proliferous in the axils, elliptic, 12–20 mm. long, 8–12 mm. wide, entire to crenulate, of firmish texture, narowed at base to a short petiole, pale gray above, white beneath; heads small, subsessile; phyllaries white-woolly; corollas white; achenes uniform, crowned with a short irregularly toothed scale-pappus (0.3 mm. high) and mostly 3 awns about equalling the corolla.—Contrib. U. S. Nat. Herb. xxii. 590, t. 54 (1924).

MEXICO: Chiapas: Los Pinos, *Goldman*, no. 1047 (U. S.); rocky places, Mt. Fenia, *Purpus*, no. 209 (Gr.).

Dr. Blake reports the heads as 7–8-flowered. The writer, examining seemingly identical material (collected by Purpus), has found them 5-flowered.

15. **S. Lemmoni** Gray. Erect or curved-ascending shrub 3–6 dm. high, finely incurved-puberulent, usually branched from near the base; branches virgate, leafy, erect or strongly ascending; leaves oblong, entire, obtuse to mostly rounded at tip, subsessile by a cuneate base or (especially the lower) shortly petioled, 4–6(–13) cm. long, 1–1.5 (–3.8) cm. wide, 3-nerved from a point above the base; inflorescence terminal on stem and branches, of dense rather large corymbously disposed glomerules; heads sessile, mostly 9–12 mm. long; phyllaries pale green, acute, hispidulous; corollas white; achenes alike, crowned with a scarious cup (of completely connate scales) about 0.4 mm. deep. —Proc. Am. Acad. xvii. 204 (1882); Syn. Fl. i. pt. 2, 92 (1884).

UNITED STATES: ARIZONA: rocky cañons of the Catalina Mts., *Lemmon*, no. 189 (Gr.), *Pringle* (Gr., K., Gen.); high mountains near Lowell, *W. F. Parish*, no. 108 (Gr.).

MEXICO: SONORA: vicinity of Alamos, *Palmer* ('90) 386 (Gr., K.), *Rose, Standley & Russell*, no. 13,101 (Gr.). DURANGO: Chacala, *Goldman*, no. 342 (Gr.); San Ramón, *Palmer* ('06) 96 (Gr.).

16. **S. revoluta** Robinson. Suberect shrub, 2.5–4 dm. high; stems or ascending branches leafy; the lower internodes very short and at anthesis often naked, the upper elongated; leaves opposite, sessile, often proliferous in the axils, narrowly lanceolate, entire, strongly discolorous, green and puberulent above, canescent-tomentose or lanulate beneath, 5–8 cm. long, 7–11 mm. wide, the margins at first clearly revolute; heads about 1 cm. long, closely glomerate or often sessile on the branches of a somewhat fastigiate corymb; phyllaries acute, often purple-tinged, finely appressed- or incurved-puberulent and often sprinkled with lucid globules; corollas with reddish throat and pink or white limb; achenes uniform, with short coroniform pappus.—Proc. Am. Acad. xliv. 617 (1909).

MEXICO: PUEBLA: rocky slopes, Cerro de Gentile, *Purpus*, no. 2539 (Gr., Brl., BM.); Cerro del Gavilan, alt. 2135–2440 m., *Purpus*, no. 3842 (Gr., BM.).

17. **S. polycephala** Bertoloni. Stems terete, lignescent toward the base, the upper internodes 5–9 cm. long; leaves opposite, petiolate, lanceolate or lance-oblong, attenuate at each end, the main cauline large, 1.5 dm. long, 4 cm. wide, serrate-dentate, puberulent above, woolly especially along the midrib beneath, pinnate-veined; heads very numerous, in large compound fastigiately branched terminal corymbs; heads slender, 10–12 mm. long; phyllaries linear, acute, green, puberulent, sprinkled with lucid sessile glands; corollas white or

(especially on the throat) roseate, hispidulous on the outside and sometimes at the mouth; achenes alike, crowned with a shallow sharply toothed cup.—Nov. Comment. Bologna, iv. 432 (1840), also Fl. Guat. 32 (a reprint). *S. arachnoidea* Robinson, Proc. Am. Acad. xxxv. 326 (1900).

GUATEMALA: Volcan de Agua, *Velasquez* (acc. to Bertoloni, l. c.), alt. 2750 m., *J. D. Smith*, no. 2327 (Gr.); Volcan de Fuego, *Savin & Godman* (K.); Cerro Quenado, Quezaltenango, alt. 2440 m., *Holway*, no. 104 (Gr.).

18. **S. Seleriana** Robinson. Shrub 3 dm. or more in height; stem terete, stout, when young densely clothed with white flocculent wool; soon glabrate; lower portion of stem at anthesis denuded of leaves, its internodes short; leaves opposite, oblong, obtusish to acute, crenate to entire, pinnate-veined, subglabrous, slightly paler and dark-punctate beneath, deflexed, sometimes carinate, 7–10 cm. long, 2–3 cm. wide, subcoriaceous, not reticulated; petiole 8–17 mm. long; corymb terminal, dense, 3–5 cm. in diameter, convex; heads 12–13 mm. long; involucre at first sublanate toward the base, 7.5 mm. long; corollas pale; their lobes spreading, broadly elliptical; achenes alike, crowned with more or less connate, erose-dentate scales about 0.5 mm. long.—Proc. Am. Acad. xxxv. 327 (1900); Blake, Contrib. U. S. Nat. Herb. xxiii. 1428 (1926).

MEXICO: Oaxaca: in mountain woods between S. Carlos and S. Bartolo, Yautepec, *C. & E. Seler*, no. 1695 (Gr.).

19. **S. subpubescens** Lag. An upright opposite-branched shrub 0.2–2.4 m. high, finely pubescent; leaves opposite, lance-oblong, acute at both ends, entire or nearly so, mostly 4–7(–9) cm. long, 1–2 cm. wide; petioles mostly 6–8(–14) mm. long; heads 1 cm. long, sessile in dense thickish corymbously disposed glomerules; phyllaries mostly dull green, very finely crisped-puberulent; corollas white or nearly so; achenes alike, with a low irregularly toothed scarious crown (0.2 mm. high). Varying as follows:

Var. **typica**. Mature cauline leaves mostly 4–6.5 cm. long, puberulent above and softly pubescent beneath, the punctation obscure or invisible.—*S. subpubescens* Lag. Gen. et Spec. Nov. 28 (1816); DC. Prod. v. 116 (1836); Sch.-Bip. Linnaea, xxv. 290 (1853); Hemsl. Biol. Cent.-Am. ii. 90 (1881), in part; Blake, Contrib. U. S. Nat. Herb. xxiii. 1426 (1926), at least in part. *S. lanceolata* Moc. acc. to DC. l. c.

MEXICO: Jalisco: stream bank, San Sebastian, alt. 1500 m., *Mexia*, no. 1501 (Gr.). Federal District: forest near San Nicolas, *Bourgeau*, no. 1066 (Gr., Conserv. Gen., Par., K.); woodlands near Eslaba, alt. 2440 m., *Pringle*, no. 11,587 (G., K.). Morelos: hillsides above Cuernavaca, alt. about 2000

m., *Pringle*, no. 7713 (Gr.); lava fields around Parque Station, alt. about 2300 m., *Pringle*, no. 9983 (Gr., K.); near El Parque, *Rose & Rose*, no. 11,106 (U.S.). PUEBLA: vicinity of Ixtaccihuatl, *Deam*, no. 26 (Gr.), 134 (Gr.); *Purpus*, nos. 174 (Gr.), 1483 (Gr., BM.); near Puebla, *Seler*, no. 839 (Gr.); Ituejotzingl, *Arsène*, no. 1789 (Gr.). OAXACA: Cordillera, alt. 2135–2600 m., *Galeotti*, no. 2186 (Conserv. Genev., Par., K.). CHIAPAS: open mountain slopes near Fenia, *Purpus*, no. 141 (Gr.). STATE UNCERTAIN: Mecoatlan S. Andres, *Liebmann*, no. 122 (Copenh., fragm. Gr.).

Var. **opaca** (Sch.-Bip.), comb. nov. Mature cauline leaves mostly 6–8(–14) cm. long and 1–3 cm. wide, glabrous except for slight pubescence at or near the margin and on the midrib; lower surface clearly dark-punctate.—*S. lucida* Lag. var. *opaca* Sch.-Bip. in Seem. Bot. Herald, 299 (1856).

MEXICO: JALISCO: mountains about Lake Chapala, *Pringle*, no. 2441 (Gr., Conserv. Gen., K.); mountain cañons near Guadalajara, *Pringle*, no. 5347 (Gr.); in oak woods, Real Alto, alt. 2500 m., *Mexia*, no. 1615 (Gr.). MICHOACAN: north slope of Mt. Tancitaro, alt. 2600–3200 m., *E. W. Nelson*, no. 6890 (Gr.); clayey soil in the Sierra Madre of MICHOACAN or GUERRERO, alt. 1700 m., *Langlassé*, no. 774 (Gr.). PUEBLA: Ixtaccihuatl, *Purpus*, no. 174 (Gr.). STATE NOT MENTIONED: in the Sierra Madre, *Seemann*, no. 2028 (Gr., K.).

In several respects this variety is transitional to *S. salicifolia* but has the broader leaves (1.5–2 cm. wide), dense inflorescence, and the exact involucre, as well as the non-vernicose nature of *S. subpubescens* with which it appears to intergrade.

20. **S. dictyophylla** Robinson. Erect shrub, 3–(probably)6 dm. high; leaves oblong-lanceolate to narrowly ovate, obtuse to acute, cuneate to the shortly petiolate base, of firm texture, puberulent and perceptibly reticulate-veiny above, the lower surface slightly paler and tomentellous especially upon the prominently exserted midrib and veins; inflorescence a dense rounded leafy-bracted corymb; heads sessile, about 9 mm. long; the phyllaries of firm texture, rounded at the back, softly puberulent and sometimes gland-dotted; corollas white or nearly so; achenes alike, slender, dark, nearly smooth, surmounted by a short scarious scale-pappus about 0.2–0.3 mm. long.—Proc. Am. Acad. xliv. 617 (1909); Blake, Contrib. U. S. Nat. Herb. xxiii. 1426 (1926). *S. subpubescens* Benth. Pl. Hartw. 19 (1839); Hemsl. l. c., in part; not Lag.

MEXICO: GUANAJUATO: about Guanajuato, *Hartweg*, no. 137 (Gr., Par., K.). MICHOACAN: Quincio near Morélia, *Arsène* (Gr.). JALISCO: hills near Guadalajara, *Pringle*, no. 2832 (Gr.); *Reko*, no. 4607 (U. S.).

A species perhaps too close to *S. subpubescens*, of which, when better known, it may prove merely a xerophytic form. However, as the distinctions of foliage and involucre are correlated with a difference of range, it seems best to maintain the species at least until intergradation has been observed.

21. **S. Nelsonii** Robinson. Erect or ascending shrub, probably 1 m. or more in height; stem and upright branches dark purple, soon defoliating except near the tips, at first grayish-tomentellous but early glabrate; foliage and involucres somewhat vernicose; leaves lance-oblong, serrate, acute or acuminate at each end, coriaceous, feather-veined, glabrous, viscid, 5–11 cm. long, 1.2–2.2 cm. wide, with a slightly raised reticulation on both surfaces; inflorescences terminal, of large dense many-headed closely crowded glomerules; phyllaries linear-oblong, acutish or subobtuse, obscurely gland-dotted; corollas with reddish tube and small whitish limb; achenes alike, coronulate.—Contrib. Gray Herb. lxxx. 9 (1928).

MEXICO: Michoacan: north slope of Mt. Patamban, alt. 2750–3350 m., *E. W. Nelson*, no. 6579 (Gr.).

22. **S. phlebophylla** Gray. Erect shrub, glabrous but viscid and somewhat vernicose, 6–9 dm. high; stems firm, lignescent almost to the summit, dark purple; leaves opposite, oblong, serrate, acute at each end, thick, prominently reticulated on both surfaces, 8–11 cm. long, 3.5 cm. wide; the midrib often red, the lateral veins numerous, diverging at a small angle and curving forward; inflorescences terminal, of few large many-headed and much congested glomerules; phyllaries hispidulous; corollas with reddish throat and tube but a white or pinkish limb; achenes alike, coronulate.—Proc. Am. Acad. xxii. 419 (1887).

MEXICO: Jalisco: Rio Blanco, *Palmer* ('86) 679 (Gr.); dry rocky slopes, Sierra de San Esteban near Guadalajara, alt. about 1700 m., *Pringle*, nos. 2291 (Conserv. Gen., Par., BM.), 9981 (Gr.).

23. **S. scabrella** Benth. Upright, probably suffruticose; stems at first incurved-puberulent and gland-sprinkled, soon glabrate, dull green or brown mottled with purple; leaves opposite or subternate, broadly ovate to elliptic-oblong, pointed at each end, subsessile, rather coarsely serrate, 3(–5)-nerved from well above the base, coriaceous, prominently but rather loosely reticulated on both surfaces, glabrous except near the margin (where hirtellous and scabrid), about 9 cm. long, half as wide; corymbs terminal, fastigiate, convex, dense; heads mostly pedicelled, about 11 mm. long; corollas presumably with reddish or purple throat and white limb; achenes alike, coronulate, exaristate.—Pl. Hartw. 19 (1839); Blake, Contrib. U. S. Nat. Herb. xxiii. 1429 (1926).

MEXICO: Jalisco: Bolaños, *Hartweg*, no. 141 (Gr., BM., K.).

24. **S. vernicosa** Greenman. Low tough-stemmed shrub, exces-

sively viscid and vernicose, 6 dm. high; stems at first puberulent, soon glabrate, dark purplish brown or often fuliginous; branches erect or strongly ascending, their first nodes close together and soon denuded of their foliage; leaves opposite, lance-oblong, the primary early deciduous, the secondary fascicled in the axils, about 4 cm. long and 6 mm. wide, finely serrate, bright green, glabrous, lucid, densely punctate; inflorescences fastigiately branched, terminal, merely convex or sometimes more elongated and forming a leafy-bracted thyrsoid panicle; heads about 12 mm. long, sessile or nearly so; achenes similar, 3–5-awned; awns long, fully equalling the apparently white corolla, slightly expanded at base but scale-pappus otherwise obsolete.—Proc. Am. Acad. xl. 33 (1904); Blake, Contrib. U. S. Nat. Herb. xxiii. 1429 (1926).

MEXICO: Morelos: dry ledges, Sierra de Tepoxtlan, alt. about 2300 m., *Pringle*, nos. 7698 (Gr.), 10,349 (Gr.). State of Mexico: rocks near timber, Mt. Ixtaccihuatl, alt. 3350–3660 m., *Purpus*, no. 185 (Gr.), a specimen suggesting transition to the next species.

25. **S. flourensioides** Blake. Low shrub in habit and copious varnishlike exudation exceedingly like the preceding; leaves somewhat larger, 5–6 cm. long, 1–1.5 cm. wide, entire, the secondary (fascicled in the axils) smaller but also entire; inflorescence of flattish terminal corymbs; corolla-tube reddish or purplish, the limb white or nearly so; achenes inconstant (even in the isotypes), being sometimes coronulate at others 1–2-awned.—Contrib. U. S. Nat. Herb. xxii. 589 (1924), xxiii. 1429 (1926).

MEXICO: State of Mexico: on rocks, Mt. Ixtaccihuatl, alt. 3355–3660 m., *Purpus*, no. 1470 (Gr., U. S., Brl., BM.).

Doubtfully distinct from the preceding.

26. **S. salicifolia** Cav. An upright usually slender-stemmed viscid and somewhat vernicose shrub, mostly 2–8 dm. in height; stems at first finely incurved-puberulent, later glabrate, commonly red or purple; branches usually ascending, very leafy and virgate, more rarely divergent and rigidulous; leaves opposite, commonly proliferous in the axils, narrowly lanceolate to linear, attenuate at each end, sharply serrate to entire, membranaceous or nearly so, feather-veined; corymbs flattish, usually 3–5-branched; heads sessile or nearly so, about 1 cm. long; phyllaries green or purple-tinged, for the most part decidedly acute; corollas white throughout or with reddish-purple throat and tube; pappus a crown of scales (about 0.5 mm. high) with or without 1–3 slender awns (about equalling the corolla).

One of the commonest and most variable members of the genus.

The size, texture, form and dentation of the leaves, as well as the presence or absence of awns in the pappus, are features here subject to wide and uncorrelated variation. Extremes of the material included below, if examined without reference to transitional forms, may well seem worthy of specific distinction, but in nature they have no boundaries. The following subdivision, while manifestly artificial, seems to provide for the more striking tendencies and permit a retention of most of the specific synonyms.

KEY TO VARIETIES.

a. Leaves (the larger cauline) usually 5–10 cm. long....*b.*
  b. Leaves lanceolate....*c.*
    c. Achenes all or most of them awned.....Var. *α. typica.*
    c. Achenes (with rare exceptions) awnless.....Var. *β. exaristata.*
  b. Leaves linear or nearly so....*d.*
    d. Most of the achenes awned.....Var. *γ. stenophylla.*
    d. Achenes awnless.....Var. *δ. anathera.*
a. Leaves averaging much shorter, even the largest seldom more than 1.5–4 cm. long....*e.*
  e. Achenes merely coronulate....*f.*
    f. Leaves linear; branches rather short, divergent, slightly rigid.....Var. *ε. collodes.*
    f. Leaves lanceolate; branches erect, virgate, pliant..Var. *ζ. integra.*
  e. Achenes (or most of them) 1–3-aristate....*g.*
    g. Leaves subentire, smoothish, mostly oblanceolate.....Var. *η. nana.*
    g. Leaves distinctly and sharply toothed, mostly lanceolate, usually hispid or puberulous on both surfaces....Var. *θ. virgulifera.*

Var. *α.* **typica.** Usually 4–8 dm. high; branches strongly ascending; leaves salicoid, lanceolate, remotely serrate or serrulate, or more rarely entire, mostly 5–9 cm. long, 6–15 mm. wide; achenes coronulate and 1–3-aristate.—*S. salicifolia* Cav. Ic. iv. 32, t. 354 (1797); DC. Prod. v. 117 (1836); Sch.-Bip. Linnaea, xxv. 290 (1853), as to his "b. *aristata*"; Hemsl. Biol. Cent.-Am. Bot. ii. 89 (1881); Blake, l. c. 1427 (1926). ? *S. ovata* Dum.-Cours. Bot. Cult. ed. 2, iv. 93 (1811). *Ageratum viscosum* Ort. acc. to Lag. Gen. et Spec. Nov. 28 (1816). *S. semperflorens* Ten. acc. to DC. l. c. in synon. *Xetoligus salicifolius* (Cav.) Raf. New Fl. iv. 74 (1838). *S. sempervirens* Steud. Nom. ed. 2, 641 (1841).

MEXICO: SONORA: Los Pinitos, *Hartman*, no. 129 (Gr.); Rincanardo, *Lloyd*, no. 395 (Gr.); San Diego Cañon, *Hartman*, no. 795 (Gr.). CHIHUAHUA: Cosiquirachi, *Wislizenus*, no. 158 (Gr.). DURANGO: Tejamen, *Palmer* ('06) no. 481 (Gr.), narrow-leaved and passing to var. *stenophylla;* Sandia Station, alt. about 2150 m., *Pringle*, no. 13.674 (Gr.). QUERÉTARO: *Bro. Agniel*, no. 10,506 (U. S.); near Cadereyta, *Rose, Painter & Rose*, nos. 9639 (Gr.), 9715 (Gr.). HIDALGO: rocky slopes of mountains, Ixmiquilpan, *Purpus*, no. 1348 (Gr.). FEDERAL DISTRICT and STATE OF MEXICO: numerous collections. PUEBLA: Atzitzintla, *Purpus*, no. 2551 (Gr.). VERA CRUZ: Orizaba, alt. 1220 m., *Seaton*, no. 100 (Gr.).

Var. β. **exaristata** Sch.-Bip. In habit and foliage closely similar to var. α.; leaves in like manner lanceolate, more or less serrate or quite entire, fully as long and as wide; achenes normally coronulate and exaristate though in rare instances a solitary awn or two in some of the heads, thus showing transition to var. α.—Linnaea, xxv. 290 (1853). *S. angustifolia* HBK. Nov. Gen. et Spec. iv. 149 (1820), including vars. α. and β.; DC. Prod. v. 117 (1836), including formal vars. *integrifolia*, *subserrata*, and *Kunthiana*. *S. integrifolia* Willd. and *S. salicifolia* Willd. not Cav. acc. to Sch.-Bip. l. c.

MEXICO: San Luis Potosi: in sandy places near the city, *Schaffner*, no. 248 (Gr.).; *Parry & Palmer*, no. 321 (Gr.). Guanajuato: *Dugès*, no. 475 (Gr.). Puebla: Toluca, *Holway*, no. 3135 (Gr.). Federal District: near the City of Mexico, *Humboldt & Bonpland* (Par., phot. & trac. Gr.).

Var. γ. **stenophylla** (Gray), comb. nov. In habit and viscidity similar to the preceding varieties, but the leaves much narrower, linear or nearly so, mostly entire or obsoletely serrate; the cauline mostly 5–7 cm. long and 1–3 mm. wide, smooth and glabrous or at margins scabrid; achenes usually unlike, 1–2 of them merely coronulate, the others with 1–3 long awns in addition to the scale-pappus.—*S. stenophylla* Gray, Proc. Am. Acad. xv. 25 (1879); Blake, Contrib. U. S. Nat. Herb. xxiii. 1427 (1926). *S. foliosa* Small, Fl. S. E. U. S. 1163, 1338 (1903).

UNITED STATES: Texas? near the lower Rio Grande, *Parry*, while on Mex. Bound. Surv. (Gr.).

MEXICO: Chihuahua: southwest part of state, *Palmer* ('85) 278 (Gr.), 391 (Gr., BM.); shaded cliffs, rocky hills near city of Chihuahua, *Pringle*, no. 677 (Gr., K., Par.); *Palmer* ('08) 335 (Gr., K.). San Luis Potosi: *Schaffner*, no. 252 (Gr.), *Parry & Palmer*, no. 319 (Gr., K.). Zacatecas: *Lloyd*, no. 6 (Gr.).

Var. δ. **anathera** Robinson. Closely resembling the preceding variety, but having leaves even more narrowly linear and achenes all exaristate.—Contrib. Gray Herb. xc. 18 (1930).

MEXICO: Zacatecas: near Concepcion del Oro, *Palmer* ('02) 401 (Gr.).

Var. ε. **collodes** (Greenman), comb. nov. Somewhat more woody than the other varieties; branches short, moderately divergent, slightly rigid; leaves linear, mostly 2–3 cm. long and 2–3 mm. wide, entire, obtuse; achenes merely coronulate.—*S. collodes* Greenman, Proc. Am. Acad. xxxix. 93 (1903).

MEXICO: Puebla: calcareous hills near Tehuacan, alt. about 1700 m., *Pringle*, no. 8570 (Gr., Par., Brl., BM., K.); near San Luis Tultitlanapa, *Purpus*, no. 2541 (Gr., Par., Brl.).

Var. ζ. **integra** (Blake), comb. nov. Dwarf, 2–3 dm. high; leaves lanceolate or lance-linear, quite entire, mostly obtusish, about 3 cm. long and 4–7 mm. wide; achenes merely coronulate.—*S. integra* Blake, Contrib. U. S. Nat. Herb. xxii. 589 (1924), xxiii. 1429 (1926).

MEXICO: Coahuila: Sierra de la Paila, *Purpus*, no. 4722 (Gr.).

Var. η. **nana** Gray. The most depauperate and xerophytic variety, 1–3 dm. high; leaves (often crowded toward the base, lanceolate to lance-linear, obsoletely serrate, rather firmly membranaceous, 1–3 cm. long, 1–4 mm. wide; achenes (all or some of them) 1–3-aristate as well as coronulate.—Proc. Am. Acad. xv. 25 (1879); Blake, l. c. 1428 (1926).

MEXICO: San Luis Potosi: in mountains, San Miguelito, *Schaffner*, no. 251 (Gr.); without precise locality, *Parry & Palmer*, no. 326 (Gr., BM., K.). Coahuila: Sierra de Parras, *Purpus*, no. 4657 (Gr., BM.). Coahuila and Nuevo Leon: *Palmer* ('80) 431 (Gr., K.). Chihuahua: shaded cliffs, rocky hills near the city of Chihuahua, *Pringle*, no. 102 = 677½ (Gr.). Northern Mexico, the state not indicated, *Parry*, no. 11 (Gr.). Querétaro: *Bro. Agniel*, no. 10,506 (Gr.), a doubtful specimen, somewhat taller and more loosely branched but otherwise very similar.

Var. θ. **virgulifera** Robinson. Branches erect or ascending, virgate, evenly leafy; leaves prevailingly lanceolate, clearly and sharply toothed; teeth short, mostly 2–3 on each side; achenes with short scale-pappus and mostly 1–3 awns each.—Contrib. Gray Herb. xc. 18 (1930).

MEXICO: Durango: vicinity of the city, *Palmer* (coll. of 1896), nos. 29 (type, Gr.) and 931 (Gr.); Tejamén, *Palmer* ('06) 481 (Gr.). Nuevo Leon: mountains, Monterey, *Pringle*, no. 10,812 (Gr.). Hidalgo: Ixmiquilpan, no. 1347 (Gr.).

27. **S. lucida** Lag. Erect glutinous and vernicose shrub, 3–9 dm. high; stem terete, usually dark gray or brown, commonly forked through the abortion of the terminal shoot, leafy; leaves opposite, slender-petioled, ovate- or lance-oblong, crenate-serrate to coarsely and irregularly dentate, mostly pinnate-veined, occasionally somewhat trinervate, acuminate to (rarely) obtuse, chartaceous, green or glaucescent and glabrous on both surfaces, often nigrescent in drying, 4–7 (rarely 2–10) cm. long, 0.7–4 cm. wide; heads about 1 cm. long, sessile or nearly so in dense corymbously disposed glomerules; phyllaries linear, acute, very gummy; corollas with white or pinkish limb and mostly reddish purple throat and tube; achenes uniform, bearing a short crown of somewhat toothed and more or less connate scales.—Gen. et Spec. Nov. 28 (1816); DC. Prod. v. 117 (1836); Sch.-Bip. Linnaea, xxv. 288 (1853), incl. vars. *latifolia* and *angustifolia;* Blake, l. c. 1428 (1926). *S. glutinosa* and *S. fastigiata* HBK. Nov. Gen. et

Spec. iv. 148 (1820). *S. glutinosa* var. *oaxacana* DC. Prod. v. 116 (1836). *S. hymenoppa* Moc. acc. to DC. l. c. 117 in synon. *S. nitida* Walp. Linnaea, xiv. 320 (1840). *S. glutinosa* var. *angustifolia* Sch.-Bip. l. c. 289.—One of the commonest, most widely distributed, and readily recognized species of the genus.

KEY TO VARIETIES.

a. Leaves feather-veined, acute to acuminate....*b*.
  b. Leaves broadly lanceolate to ovate-oblong, crenate-serrate to rather coarsely dentate, flat, about thrice as long as wide, commonly (not always) darkening in drying.....Var. *α. typica.*
  b. Leaves narrowly lanceolate, 4–6 times as long as wide, finely to coarsely and jaggedly toothed, tending to be conduplicate, scarcely nigrescent in drying.....Var. *β. Bipontini.*
a. Leaves 3-nerved from near the base, elliptic-ovate, obtuse, flat, about twice as long as wide, somewhat nigrescent in drying Var. *γ. pueblensis.*

Var. *α*. **typica**. The common and widely distributed form with acute or acuminate serrate or dentate leaves about 3 times as long as wide, usually nigrescent in drying.—Synonomy as above stated.

MEXICO: SAN LUIS POTOSI to CHIAPAS (many collections).
GUATEMALA: Cunén, Dept. Quiché, alt. 1830 m., *Heyde & Lux*, no. 3374 (Gr.); Huehuetenango, 1525 m., *Holway*, no. 772 (Gr.).
COSTA RICA: Laguna del Reventado, on Vol. Irazú, alt. 2300 m., *Pittier*, no. 14,073 (Gr.); without locality, *Oersted* (Gr., K.).
PANAMA: Vol. Chiriqui, *Warszewicz*, no. 31 (Brl.).
[COLOMBIA: from Cauca to Santa Marta (many collections). Used for inflamation (Killip & Smith).]
[VENEZUELA: Paramo de Mucuchies, *Moritz*, no. 368 (K.); Paramo de los Apartaderos, alt. 3300 m., *Jahn*, no. 546 (Gr.); Caracas and vicinity (several collections).]

Var. *β*. **Bipontini**, nom. nov. Leaves narrowly lanceolate, gradually attenuate almost from the base to the tip, often conduplicate, remaining green after drying, coarsely and irregularly toothed or more rarely subentire.—*S. grandidentata* Sch.-Bip. ex Klatt, Leopoldina, xx. 75 (1884), not Sch.-Bip. Bull. Soc. Bot. Fr. xii. 81 (1865).

MEXICO: PUEBLA: limestone hills near Tehuacan, *Liebmann*, no. 128 (Copenh., sk. Gr.), a form with the most incised foliage; *Pringle*, no. 7036 (Gr.), with leaves less deeply cut; vicinity of San Luis Tultitlanapa, *Purpus*, no. 2540 (Gr.), a form with leaves rather obscurely serrate.

Var. *γ*. **pueblensis** Robinson. The opposite extreme from the preceding; leaves short and relatively broad, elliptic-ovate, obtuse, finely crenate-serrate, 3-nerved from a point near the base.—Contrib. Gray Herb. xc. 15 (1930).

MEXICO: PUEBLA: on rocks, vicinity of San Luis Tultitlanapa, *Purpus*, no. 3036 (Gr.). VERA CRUZ: Maltrata, alt. 1700 m., *Seaton*, no. 389 (Gr.).

28. **S. pyrolaefolia** Schlecht. A low shrub of neat foliage, glabrous up to the somewhat puberulent inflorescence; leaves oval to broadly elliptic, obtuse, crenate-serrate, cuneate at base, subcoriaceous, much paler beneath, punctate, glutinous when young, 3–4 cm. long, 2–3 cm. wide; heads about 1 cm. long, subsessile, in dense often long-stalked glomerules, together forming a flattish usually trifid corymb; involucre vernicose, the phyllaries narrowly oblong, obtuse; corollas supposed to be white, but probably roseate at least on the throat; achenes unlike, 1 merely coronulate, the others 1–3-aristate as well as coronulate.—Linnaea, xvi. 326 (1842); Sch.-Bip. Linnaea, xxv. 291 (1853).—Known only from the original collection.

MEXICO: Hidalgo: on Mt. Kankandó en la Encarnacion, *Ehrenberg*, no. 1094 (Brl., phot. Gr., Par., trac. Gr.).

29. **S. Berlandieri** Gray. Low shrub, 3–6 dm. high, smoothish or variously glandular or puberulent; leaves broadly ovate, obtuse, coarsely crenate, abruptly contracted to a cuneate base or sometimes subcordate, 3(–5)-nerved from near the base, firmly membranaceous, often sticky, 1.5–4.5 cm. long, 1–4 cm. wide; heads about 1 cm. long, in dense glomerules disposed in flattish corymbs; phyllaries linear, acute to attenuate; corollas white or pale rose, the throat and tube often deeper red or purple; achenes alike, all crowned by a short slightly toothed and more or less connate scale-pappus.—A species of northern Mexico, varying as follows:

Key to Varieties.

Phyllaries sprinkled with sessile glands, otherwise nearly smooth.
Var. *α. typica.*
Phyllaries beset with stiffish spreading usually gland-tipped hairs.
Var. *β. podadenia.*
Phyllaries covered with short mostly incurved non glandular hairs.
Var. *γ. anadenotricha.*

Var. *α.* **typica.** Minutely glandular-pulverulent, otherwise smooth or with vestiges of puberulence; phyllaries sprinkled with sessile lucid globules.—*S. Berlandieri* Gray in Torr. Bot. Mex. Bound. 73 (1859); Robinson, Proc. Am. Acad. xliv. 616 (1909).

MEXICO: Tamaulipas: in the Sierra near San Carlos, *Berlandier*, no. 3160 (Gr., K.). Nuevo Leon: southeast of Monterey, *Palmer* ('80) 432 (Gr., K.); wooded slopes of the Sierra Madre near Monterey, *Pringle*, nos. 1899 (Gr., Gen., Brl., BM., K.), 9978 (Gr.), 11,573 (Gr., Brl., K.); valley near El Diente, *Endlich*, no. 875 (Brl.). Coahuila: near Saltillo, *Gregg*, no. 224 (Gr.).

Var. *β.* **podadenia** Robinson. Spreading-puberulent and to some extent spreading-villous, the hairs on the pedicels and phyllaries mostly gland-tipped.—Proc. Am. Acad. xliv. 616 (1909).

MEXICO: San Luis Potosi: San Miguelito Mts., *Schaffner*, no. 247 (Gr., Brl.); *Parry & Palmer*, no. 322 (Gr., Par., BM., K.); Alvarez, *Palmer*, no. 601 (Gr., U. S.).

Var. γ. **anadenotricha** Robinson. Finely incurved-puberulent, the hairs not gland-tipped; leaves somewhat larger than in the two other varieties, 4.5 cm. long, subcordate; corollas apparently with white limb and yellowish rather than (as in the other varieties) reddish throat and tube.—Proc. Am. Acad. xliv. 617 (1909). *S. monardaefolia* var. *cordifolia* Gray, Proc. Am. Acad. xxi. 431 (1886), without char.

MEXICO: Chihuahua: Frayles, *Palmer* ('85) 257 (Gr.).

30. **S. glandulosa** Hook. & Arn. Low densely glandular-pubescent and viscid shrub, dichotomously branched or often several-stemmed from near the base, 0.3–1 m. high; leaves opposite, slender-petioled, ovate-oblong, mostly acute, rather sharply serrate, 3-nerved from near the base, green and pubescent on both surfaces, 2.5–4.5 cm. long, about half as wide; corymbs terminal, dense; heads 11–14 mm. long; phyllaries oblong-linear, acute, green, hispidulous; corollas with white or pale pink limb and slender lilac or purple tube; achenes alike, with a subentire coroniform pappus about 0.4 mm. high.—Bot. Beech. 296 (1840); Blake, Contrib. U. S. Nat. Herb. xxiii. 1425 (1926).

MEXICO: Sonora: dry mountains, Nacori, *Hartman*, no. 273 (Gr., K.). Tepic: *Sinclair* acc. to Hemsl.; *Palmer* ('92) 1821 (Gr.). Jalisco: without exact locality, *Beechey* (K., phot. Gr.); open hillside, San Sebastian in the western Sierra, alt. 1500 m., *Mexia*, no. 1476-a (Gr., U. S.).

Slightly fragrant and employed medicinally (Mexia).

31. **S. jaliscensis** Robinson. Erect shrub, probably 1–2 m. high; stem tomentellous when young, becoming 1 cm. thick toward the base, its wood white, fine-grained, hard; bark firm, dark gray, longitudinally wrinkled; leaves opposite, petiolate, ovate-lanceolate, obtuse to acute, crenate or somewhat irregularly serrulate, entire and rather abruptly cuneate at base, puberulent above, grayish-tomentellous beneath, feather-veined, 5–10 cm. long, 1.5–3.5 cm. wide; petiole 12–25 mm. long; corymb compound, terminal, convex, 8–22 cm. in diameter; heads 12–14 mm. long, borne in glomerate 3-headed cymules, the terminal head in each sessile, the lateral distinctly pedicellate; phyllaries linear-oblong, abruptly pointed, dorsally spreading-puberulent or tomentellous, the hairs white, attenuate, eglandular; corollas white or nearly so; achenes alike, surmounted by a subentire scarious ring or collar about 0.4 mm. high.—Contrib. Gray Herb. lxxx. 8 (1928).

MEXICO: Jalisco: hills near Guadalajara, alt. about 1525 m., *Palmer* ('86) 224 (Gr., Par.), 673 (Gr., Par., K.); *Pringle*, nos. 1773 (Gr., Conserv. Gen., Par., K.), 9984 (Gr., K.). *Galeotti*, no. 2394 (Gen.), from the banks of the Rio Grande de Lerma near Guadalajara, is probably also referable to this species, although a single pappus-awn occurs in some few of its heads.

A plant originally identified and distributed as *S. subpubescens*, but differing in its longer petioles, somewhat looser inflorescence, relatively broader often obtuse leaves, and subtomentellous phyllaries

Subser. 2. HERBACEAE.

Herbaceous or nearly so.

Key to Species.

A. Leaves sessile, subsessile, or gradually narrowed at base to a short petiole....*B*.
B. Leaves alternate or scattered....*C*.
C. Heads sessile in dense glomerules; pappus exaristate.32. *S. pilosa.*
C. Heads (or many of them) perceptibly pedicellate, in somewhat looser corymbs; pappus aristate except in var. ϵ. of no. 38....*D*.
D. Heads 14–15 mm. long; achenes (all or most of them) 5-aristate. Here may be sought occasional short-pedicelled specimens of.....11. *S. viscida.*
D. Heads 8–12 mm. long; pappus-awns (if present) mostly 1–3 (rarely 4–5)....*E*.
E. Leaves narrowly oblong, about equally and rather abruptly narrowed at tip and base: phyllaries covered with very small dark stipitate glands...33. *S. eupatoria.*
E. Leaves ovate to elliptic, rounded or obtuse at base; phyllaries covered with fine soft glandless white hairs and a few pale lucid sessile glands.....34. *S. ovalis.*
E. Leaves prevailingly oblanceolate, with attenuate base, but varying to linear or to elliptic-oblong; phyllaries covered by incurved glandless hairs and dark sessile glands....*F*.
F. Heads in small glomerules; these disposed in a loose pyramidal panicle; leaves grayish-tomentellous and slightly scabrid on both surfaces.....35. *S. scabridula.*
F. Heads in a round-topped fastigiate corymb....*G*.
G. Leaves cinereous-tomentose beneath and not visibly punctate.....36. *S. hypomalaca.*
G. Leaves glabrous to moderately pubescent, always clearly punctate beneath....*H*.
H. Corollas and often the phyllaries deep purple; leaves tending to be narrowly oblong and subentire.....37. *S. purpurea.*
H. Corollas white to roseate; leaves varying from linear to oblanceolate or oblong, attenuate at base and (except when narrowly linear) clearly serrate.....38. *S. serrata.*
B. Leaves (at least the main cauline) opposite or rarely verticillate....*I*.

I. Leaf-base amplexicaul, the blade linear-oblong, 3-nerved; awns of the adelphocarps about equalling the corollas. 39. *S. connata.*

I. Leaf-base rounded; blade elliptic-oblong, 5-nerved; awns scarcely half as long as the corollas.....40. *S. Rosei.*

I. Leaf-base narrow, mostly cuneate....*J*.

J. Leaves entire or but obsoletely toothed....*K*.

K. Pappus merely coronulate, no awns present....*L*.

L. Leaves elongate-linear (12–20 times as long as wide); phyllaries said to be ovate.....41. *S. linearifolia.*

L. Leaves elliptic-lanceolate, about 4 times as long as wide. Here may be sought entirish-leaved forms of.....49. *S. venosa.*

K. Some or all achenes in each head awned....*M*.

M. Leaves linear....*O*.

O. Leaves coriaceous, 7–9-ribbed; pappus-awns 5–6. 42. *S. neurophylla.*

O. Leaves fleshy, 1-nerved; pappus-awns of adelphocarps mostly 3.....43. *S. pelophila.*

M. Leaves lanceolate to lance-oblong, firmly membranaceous, about 5 times as long as wide..44. *S. origanoides.*

M. Leaves elliptic, softly membranaceous, more than half as wide as long.....45. *S. dissitifolia.*

J. Leaves (at least the larger) clearly toothed....*P*.

P. Pappus coroniform, exaristate....*Q*.

Q. Phyllaries incurved-puberulent with glandless hairs and beset with sessile glands....*R*.

R. Leaves oblanceolate, thickish, toothed only near the rounded tip.....46. *S. hirtiflora.*

R. Leaves linear-lanceolate to ovate-oblong, acutish to acuminate....*S*.

S. Achenes said to be 2 mm. long and leaves acuminate.....47. *S. Karwinskyana.*

S. Achenes 3–4 mm. long; leaves acutish to attenuate....*T*.

T. Stem permanently puberulent; leaves obviously toothed, puberulent or hispidulous at least on the veins beneath.....48. *S. Plummerae.*

T. Stem at maturity glabrous; leaves obscurely and remotely serrulate or crenulate, glabrous.....49. *S. venosa.*

R. Leaves rhombic-ovate.....54. *S. rhombifolia.*

Q. Phyllaries closely beset with short straight wide-spreading gland-tipped hairs.....64. *S. elongata.*

P. One or more of the achenes in each head awn-bearing ....*U*.

U. Lower leaves spatulate-oblong, toothed only toward the apex; corollas crimson-purple; stem simple to the inflorescence; pappus (of the adelphocarps) 3-awned.....50. *S. pubescens.*

U. Lower leaves oblanceolate-oblong, toothed from below the middle....*V*.

V. Stem simple to a small densely glomerate inflorescence; corollas and phyllaries deep crimson; pappus-awns mostly 1(–2) in each head. 51. *S. clinopodioides.*

V. Stem branched much below the wide convex

corymb; corollas white or ochroleucous; pappus of the adelphocarps 2-3-awned.....52. *S. Palmeri.*

U. Lower leaves lanceolate to lance-oblong, finely and often sparingly toothed from below the middle; stem copiously branched; corollas white..44. *S. origanoides.*

U. Lower leaves ovate to rhombic....*W.*

W. Inflorescence relatively loose; heads mostly pedicelled, fastigiately cymose or sometimes subracemose; leaves sparingly puberulous to subglabrous, slightly carneous, the upper chiefly alternate subelliptic.....53. *S. ovata.*

W. Heads mostly in densish glomerules disposed in convex corymbs; leaves thinly to firmly membranaceous, the upper normally opposite, mostly lanceolate.....54. *S. rhombifolia.*

A. Leaves (at least the middle and lower cauline) on petioles (or petioliform bases) more than a quarter their length....*X.*

X. Leaves white-velvety or -woolly beneath....*Y.*

Y. Leaves obtuse, oblong-ovate to broadly ovate, tending to be rather finely crenate; awns (if present) mostly 1–2. 55. *S. tomentosa.*

Y. Leaves acute or acutish, rhombic-ovate, mostly incised-serrate; awns (if present) mostly 3–4.....56. *S. nepetaefolia.*

X. Leaves neither white-velvety nor -woolly beneath....*Z.*

Z. Annual; pappus-awns clearly exceeding the corolla; here may possibly be sought.....2. *S. micrantha.*

Z. Perennial; pappus-awns (if present) shorter than or barely equalling the corolla....*a.*

a. Subscapose; fully developed leaves almost confined to the lowest quarter of the stem; the others few, remote, much reduced.....57. *S. Seemannii.*

a. Stems subequally leafy to the base of the inflorescence ....*b.*

b. Leafblade (above the cuneate petioliform base) cordate....*c.*

c. Heads on distinct pedicels (1–6 mm. long), in small fastigiate glomerules; corollas white or nearly so; achenes heteromorphous, the adelphocarps each with 1 or 2 bristle-like awnlets about twice the length of the erose collar.....58. *S. cordifolia.*

c. Heads sessile or nearly so; corollas roseate or purple at least on the throat; achenes alike, exaristate. 59. *S. latifolia.*

b. Leafblade not cordate....*d.*

d. Pappus of distinct or more often connate scales with or without awns of full length (about equalling the corolla); leaves nerved from the base or from a point somewhat above the base....*e.*

e. Phyllaries subglabrous to incurved-puberulent, the hairs glandless but usually interspersed with sessile glands....*f.*

f. Phyllaries acute to acuminate; leaves mostly 3–7 cm. long....*g.*

g. Stem hirsute with rather long spreading and jointed white hairs.....60. *S. hirsuta.*

g. Stem crisped- or incurved-puberulent or finely pubescent....*h.*

h. Phyllaries linear-oblong, abruptly narrowed to an acute or acuminate tip, thin, submembranaceous, rounded or but obscurely keeled, imbricated for most of their length, usually incurved-puberulent....*i.*

i. Heads pedicelled, rather loosely disposed in a fastigiate panicle; upper leaves chiefly alternate, subelliptic.....53. *S. ovata.*

i. Heads mostly in rather dense glomerules disposed in convex corymbs; upper leaves normally opposite, mostly lanceolate....*j.*

j. Expanded part of leafblade broadly ovate, mostly obtuse, rather abruptly contracted to a petiolar portion more than a quarter as long..61. *S. reglensis.*

j. Expanded part of leafblade rhombic-ovate, subacute to acuminate, gradually narrowed at base to a mostly short petiole.....54. *S. rhombifolia.*

h. Phyllaries linear-lanceolate, gradually narrowed to apex, of firmish texture, usually keeled below, scarcely imbricated above the middle, pale except when purple-tinged, subglabrous.....62. *S. jorullensis.*

f. Phyllaries obtuse to rounded at tip; leaves mostly 8–15 cm. long.....63. *S. amblyolepis.*

e. Phyllaries beset with perceptibly but often very shortly stiped glands....*k.*

k. Leaves pubescent beneath only on midrib and veins.....64. *S. elongata.*

k. Leaves finely and softly pubescent beneath on veinlets and surface as well as on midrib and chief veins....*l.*

l. Leaves obtuse, 2–2.5 cm. wide.....65. *S. Purpusii.*

l. Leaves acuminate, mostly 3.5–7 cm. wide. 66. *S. monardaefolia.*

d. Pappus of very short awns; leaves (large) pinnately veined.....67. *S. microchaeta.*

32. **S. pilosa** Lag. Erect, perennial, 3–5 dm. high; stem virgate (or divided almost from the base into erect virgate branches), densely leafy, incurved-puberulent and (in the typical form) also pilose-hirsute (the hairs white, jointed, not gland-tipped, the longer spreading, crisped, the shorter minute, upturned); leaves alternate, proliferous in the axils, linear to narrowly oblanceolate, obtuse to acutish, entire or more often sharply few-toothed toward the end, gradually narrowed to the sessile base, 2–3 cm. long, 2–6 mm. wide, punctate, 3-nerved, subglabrous above, sparingly coarse-haired beneath; heads sessile, in dense terminal or corymbosely disposed glomerules; phyllaries lanceolate, acute, usually dark purple toward the tip; corollas crimson, somewhat hispid; achenes alike, crowned by oblong denticulate obtuse or rounded scales (nearly 1 mm. long).

KEY TO FORMS.

Stems with double pubescence, namely a long spreading pilosity and a much shorter and finer incurved or subappressed puberulence.....Forma *α. typica.*
Stem with the short incurved or subappressed puberulence only.
Forma *β. puberula.*

Forma *α.* **typica**. Apparently the more common form; stem spreading-pilose with white articulated glandless and usually crisped hairs (about 1 mm. in length) and bearing also an (often obscured) incurved or subappressed glandless puberulence of much finer and shorter hairs.—*S. pilosa* Lag. "*Elench. H. R. M. ann.* 1805" ex Gen. et Spec. Nov. 26 (1816); Hemsl. Biol. Cent.-Am. Bot. ii. 88 (1881). *S. conferta*, *α. pilosa* (Lag.) DC. Prod. v. 116 (1836). *S. conferta*, formae *capitata*, *corymbosa* & *ramosa* Schlecht. Hort. Hal. 16 (1841). *S. purpurea*, *β. dianthoides* Sch.-Bip. Linnaea, xxv. 285 (1853).

MEXICO: GUANAJUATO: near the city of Guanajuato, *Neé* (supposed source of the seeds from which the type material was grown). HIDALGO: Real del Monte, *Coulter*, no. 280 (Gr., K.), *Ehrenberg*, nos. 490 (Gr.), 491 (Gr.); Sierra de Pachuca, alt. about 2900 m., *Pringle*, no.. 8236 (Gr., Univ. Gen., BM., K.); between Somoriel and Las Lajas, *Rose, Painter & Rose*, no. 9232 (U. S.); rocky hills, Cuyamuloya Station, alt. about 2300 m., *Pringle*, no. 13,781 (Gr.). VERA CRUZ: Orizaba, alt. 2750 m., *Seaton*, no. 275 (Gr.). PUEBLA: Boca del Monte, *Purpus*, no. 2642 in part (Gr.). STATE OF MEXICO and FEDERAL DISTR.: clearings in oak woods near Santa Fé, *Bourgeau*, nos. 605 (Gr., Conserv. Gen., Par., BM., K.), 817 (Conserv. Gen., K.); Valley of Mexico, *Schaffner* (Gr.); near Mexico City, *Berlandier* (Conserv. Gen., phot. Gr.); Esclaba, *Pringle*, nos. 9547 (Gr., K.), 11,583 (Gr., K.); Flor de Maria, *Pringle*, no. 3478 (Gr.).

The forms *capitata*, *corymbosa* and *ramosa*, briefly characterized by Schlechtendal, appear to be merely vegetative states due to differing degrees of luxuriance.

Forma *β.* **puberula** (DC.), comb. nov. Stems covered with short incurved or subappressed puberulence and almost or entirely destitute of the long spreading pilosity; in other respects like the preceding form.—*S. conferta*, *β. puberula* DC. Prod. v. 116 (1836).

MEXICO: TAMAULIPAS: on mountains near Miquihuana, alt. 2100–2750 m., *E. W. Nelson*, no. 4486 (Gr.). QUERÉTARO: near Higuerillas, *Rose, Painter & Rose*, no. 9734 (Gr.). FEDERAL DISTR.: near the City of Mexico, *Berlandier*, no. 663 (Conserv. Gen., phot. Gr.); Serrana de Ajusco, *Pringle*, no. 7274 (Gr.), *Harshberger*, no. 127 (Gr.).

33. **S. eupatoria** (Spreng.) Willd. Erect, perennial, at first virgate, later (especially in cultivated material) much branched above, 3–6 dm. high; stem terete, purple, incurved-puberulent, very leafy; leaves alternate or scattered, lance-oblong, denticulate toward the acutish tip or sometimes quite entire, flat, scarcely narrowed toward

the abruptly contracted sessile base, 3-nerved, punctate, obscurely hirtellous; heads 10–12 mm. long, shortly pedicelled in fastigiate terminal corymbs; phyllaries closely beset with dark spherical very shortly stipitate glands; corollas crimson to pink on the throat and tube, roseate to white on the limb; achenes coronulate, unlike, the 4 adelphocarps 3–4-awned, the idiocarp exaristate.—Spec. Pl. iii. 1775 (1804) & Enum. Hort. Berol. ii. 854 (1809); HBK. Nov. Gen. et Spec. iv. 141 (1820); Sch.-Bip. Linnaea, xxv. 285 (1853); Hemsl. Biol. Cent.-Am. Bot. ii. 85 (1881) only in part. *Mustelia eupatoria* Spreng. Nachtr. 1, Bot. Gart. Halle, 28 (1801) & Trans. Linn. Soc. vi. 152, t. 13 (1802). *S. hyssopifolia* Cav. Desc. 190 (1802). ? *S. stricta* Hornem. Hort. Hafn. ii. 792 (1815).

MEXICO: Hildalgo: near Real del Monte, *Coulter*, no. 279 (Gr., K.), *Ehrenberg*, no. 492 (Gr.); Sierra de Pachuca, alt. about 2900 m., *Pringle*, no. 8220 (Gr., Par., BM., K.); between Somoriel and Las Lajas, *Rose*, *Painter & Rose*, no. 9186 (Gr., U. S.). *Puebla:* meadows above Boca del Monte, *Purpus*, no. 6478 in chief part (Gr., BM.); Hacienda Guadelupa near Puebla, *Bro. Nicolas* (Gr.). State of Mexico and Federal Distr.: Guadelupe, *Bilimek*, no. 502 (Gr.); near Toluca, *Pringle*, no. 2814 (Gr.); meadows, Flor de Maria, *Pringle*, no. 3246 (Gr., BM., K.).

A species at one time somewhat widely cultivated in botanical gardens under a variety of names.—*purpurea*, *hyssopifolia*, *serrata*, *stricta*, etc.

34. **S. ovalis**, comb. nov. Erect, virgate, perennial, 3–5 dm. high; stem villous-hirsute with long white crisped and articulated hairs, leafy throughout; leaves alternate, sessile, oval to elliptic-oblong or rarely obovate, crenate from the middle, obtuse to rounded at apex, pubescent on both surfaces, 1.5–2.5 cm. long, 8–13 mm. wide, usually deflexed; corymb many-headed, fastigiately branched, convex, 3–8 cm. in diameter; heads about 7 mm. long, on pedicels mostly 2–4 mm. in length; phyllaries incurved- or subappressed-puberulent and sprinkled with light-colored often lucid glands; corollas white; achenes alike, coronulate, 3-aristate.—*S. serrata*, var. *ovalis* Robinson, Proc. Am. Acad. xxix. 317 (1894).

MEXICO: Jalisco: rocky hills near Guadalajara, *Palmer* ('86) 309 (Gr., Par., K.), *Pringle*, no. 4491 (Gr., Par., BM.); Sierra San Estaban, alt. 1525 m., *Pringle*, no. 11,586 (Gr., K.).

This plant has an inflorescence remarkably like that of *S. serrata*, but differs from that species in having much broader leaves, paler involucral glands, and isocarpous nature.

35. **S. scabridula** Robinson. Erect closely grayish-puberulent or even -tomentellous perennial, alternately branched above; stem terete,

dark-purple but covered with fine gray puberulence; pith white; leaves both alternate and opposite, sessile, frequently conduplicate, the cauline oblanceolate, often deflexed; entire toward the gradually narrowed base, obscurely crenate-serrulate, subobtuse at the tip, about 5 cm. long and 1 cm. wide, the rameal narrowly oblong, about 2 cm. long, 4–5 mm. wide; heads shortly pedicelled or subsessile in fastigiate glomerules; these disposed rather loosely in a pyramidal inflorescence; phyllaries linear-lanceolate, acute, 6 mm. long, pale green or purple-tinged toward the apex; corollas with short hispid proper tube, purple throat and spreading white dorsally hispid lobes; achenes 3.7 mm. long, heteromorphic; the 4 adelphocarps scabrid on both the angles and faces, with short scale-pappus and 3–4 long awns; the idiocarp slightly stouter, scabrid only on the angles, crowned with a short cuplike pappus of connate erose scales and exaristate.—Contrib. Gray Herb. xc. 19 (1930)

MEXICO: Jalisco: Guadalajara, Oct. 1886, *Palmer* ('86) 692 (Gr.).

36. **S. hypomalaca** Robinson. Erect, virgate, perennial, 0.8–1.5 m. high; stem lanate-tomentose, densely leafy throughout; leaves alternate, narrowly oblanceolate-oblong, obtuse, obsoletely crenate-serrate toward the tip, grayish-puberulent above, white-tomentose beneath, narrowed to a sessile base, membranaceous, 3 cm. long, 5–8 mm. wide, usually deflexed; corymb terminal, fastigiate, convex, 9–12 cm. in diameter; heads about 1 cm. long, on pedicels mostly 1–3 mm. in length; phyllaries green, incurved-puberulent and spotted with sessile glands; corollas white, the throat and tube pubescent and sprinkled with sessile glands; achenes coronulate, unlike, the 4 adelphocarps 5-aristate, the idiocarp exaristate.—Contrib. Gray Herb. xc. 13 (1930).

MEXICO: Morelos: mountainside above Cuernavaca, alt. about 2000 m., *Pringle*, nos. 6603 (Gr., K.), 9976 (Gr.).

Mistakenly distributed as *S. canescens* HBK.

37. **S. purpurea** Pers. Erect perennial, 3–6 dm. high; stems virgate or sometimes copiously branched, leafy throughout; leaves alternate or scattered, often proliferous in the axils, oblanceolate-oblong to -linear, subentire to shallowly serrulate toward the obtuse to rounded apex, narrowed to the sessile base, 1.5–3 cm. long, 2–8 mm. wide, punctate on both surfaces, subglabrous, often carinate; corymb terminal, flattish-topped, fastigiately branched; heads (at maturity) distinctly pedicellate; phyllaries acute, 6 mm. long, green or more often claret-colored, shortly incurved-puberulent; corollas a rich bright

purple; achenes all coronulate (the scales nearly 1 mm. long), the 4 adelphocarps also 3-aristate, the idiocarp either awnless or bearing 1–3 very reduced awns (not 1.5 mm. in length).—Syn. ii. 402 (1807) excl. synon.; Jacq. Fragm. 80, t. 127, f. 2 (1809); Sch.-Bip. Linnaea, xxv. 285 (1853) as to var. *α. purpurea;* Hemsl. Biol. Cent.-Am. Bot. ii. 89 (1881).

MEXICO: Coahuila: near Saltillo, *Palmer* ('80) 433 (Gr., K.), 433a (Gr., K.). San Luis Potosi: in mountains near Morales, *Schaffner*, no. 244 [= 686] (Gr., U. S., BM.); *Parry & Palmer*, nos. 323 (Gr., BM., but *S. viscida* under this number at K.), 323½ (Gr., where mixed with *S. viscida*); hillsides, San José Pass, *Pringle*, no. 3176 (Gr., BM., K.); near the city of San Luis Potosi, *Palmer* ('02) 37 (Gr.); Alvarez, *Palmer* ('02) 169 (Gr.); Minas de San Rafael, *Purpus*, no. 5147 (Gr.). Durango: in low moist grassy bottoms, Santiago Papasquiaro, *Palmer* ('96) 456 (Gr., BM.); Otinapa, *Palmer* ('06) 463 (Gr.); between E Oro and Guanacevi, *Nelson*, no. 4738 (Gr.). Aguas Calientes: *Hartweg*, no 135 (Gr., K.). Hidalgo: between Pachuca and Real del Monte, *Rose & Painter*, no. 6696 (Gr., U. S.); Cerro Ventosa, above Pachuca, *Pringle*, no. 7899 (Gr.). Puebla: meadows, Boca del Monte, *Purpus*, nos. 2552 (Gr., BM.), 2642 in part (Gr.). State of Mexico: Flor de Maria, *Pringle*, no. 3479 (Gr.).

Apparently not rare in botanical gardens a century or more ago. The cultivated specimens usually are paler-flowered, less strict in habit, becoming more branched and tending to have looser inflorescence.

38. **S. serrata** Cav. Erect perennial, 4–8 dm. high; stem finely incurved-puberulent to copiously spreading-pilose, usually virgate, very leafy; leaves alternate or scattered, tending to be proliferous in the axils, more often oblanceolate to spatulate-linear, but in some forms narrowly linear or oblong or even oval, usually toothed from the middle, rarely entire, 3–5 cm. long, usually 2–8 mm. wide, attenuate and entire toward the sessile base, green and punctate on both surfaces, hirtellous chiefly on the veins and margins, often carinate, spreading or deflexed; corymb terminal, fastigiately branched, convex, 5–15 cm. in diameter; heads 8–10 mm. long, distinctly but sometimes very shortly pedicellate; phyllaries pale green, incurved- or subappressed-puberulent and sprinkled with dark sessile glands; corollas white or pale rose; achenes coronulate, usually unlike, some of them being awned and others in the same head awnless or nearly so, much more rarely all of the achenes awnless.—One of the commonest, most widely distributed and variable species of the genus.

Key to Varieties.

a. Achenes (or most of them) 1–4-awned....*b.*
  b. Leaves spatulate-oblanceolate, serrate; lateral nerves or veins evident.....Var. *α. typica.*

b. Leaves very narrowly oblanceolate-linear to strictly linear ....*c*.
c. Leaves serrate, usually sharply so.....Var. β. *arguta*.
c. Leaves entire or nearly so.....Var. γ. *linoides*.
b. Leaves lanceolate to oblanceolate-oblong or even oval..Var. δ. *ivaefolia*.
a. Achenes all merely coronulate and awnless.....Var. ε. *haplopappa*.

Var. α. **typica**. Leaves oblanceolate to spatulate, usually 3–7 mm. wide above the middle and serrate from the middle or at least toward the tip, gradually narrowed and entire toward the sessile base, perceptibly 3-nerved near the base; achenes all coronulate, the 3–4 adelphocarps normally 3–4-awned, the 1–2 idiocarps usually awnless or with but 1–2 awns; corollas white or nearly so.—*S. serrata* Cav. Ic. 33, t. 355 (1797). Probably *Ageratum punctatum* Ort. Dec. 37 (1797) and thus at least as to name-bringing synonym *S. punctata* (Ort.) Pers. Syn. ii. 403 (1807). (For more detailed discussion see Robinson, Contrib. Gray Herb. lxxx. 10–12.) *Ageratum punctatum* Jacq. Hort. Schönbr. iii. 28, t. 300 (1798). *S. virgata* HBK. Nov. Gen. et Spec. iv. 142 (1820). *S. ivaefolia* β. ? *bogotensis* DC. Prod. v. 118 (1836). *S. punctata* (Jacq.) Sch.-Bip. Linnaea, xxv. 286 (1853).

UNITED STATES: foothills and mountains of southern New Mexico and southern Arizona.
MEXICO: common and widely distributed, especially in the uplands.
CENTRAL AMERICA: common at least in parts of Guatemala.
[COLOMBIA: frequent on grassy slopes, etc., region of Bogotá, Tequendama, etc.]
[VENEZUELA: Paramo del Zumbador, Prov. Merida, *Linden*, no. 693 (Gen. The same number also at Kew and Brit. Mus. where labelled probably by error as from Colombia.)]
[ECUADOR: hills and mountains about Quito, *Jameson*, no. 619 (Par.), *Sodiro*, no. 471 (Gr.); Prov. Pichincha, *Firmin*, no. 313 (Gr.).]

Var. β. **arguta** Robinson. Leaves narrowly oblanceolate-linear to strictly linear, rather conspicuously and for the most part sharply serrate; inflorescence, florets, pappus, etc., as in the typical variety.—Proc. Am. Acad. xxxv. 328 (1900).

MEXICO: HIDALGO: Cerro Ventoso above Pachuca, *Pringle*, no. 7652 (Gr.); hills, El Salto, *Pringle*, no. 11,316 (Gr., K.). STATE OF MEXICO and FEDERAL DISTRICT: *Bourgeau*, no. 368 (Gr.); *Rose & Painter*, no. 7809 (Gr.).

An unimportant form somewhat transitional between the preceding and the following varieties.

Var. γ. **linoides** (Sch.-Bip.) Robinson, comb. nov. Inflorescence, pappus, etc., as in var. α.; leaves linear or nearly so, entire to sparingly and bluntly toothed.—*S. linoides* Sch.-Bip. Linnaea, xxv. 284 (1853).

MEXICO: southwestern CHIHUAHUA, *Palmer* (coll. of 1885) 251 (Gr.). DURANGO: among pines and oaks, *Palmer* (coll. of 1896) 799 (Gr.). ZACATE-

CAS: near Plateado, *Rose*, no. 2773 (Gr.). JALISCO: moist places about Guadalajara, *Pringle*, nos. 2486 (Gr.), 11,579 (Gr.); Rio Blanco, *Palmer* (coll. of 1886) nos. 316 (Gr.), 534 (Gr.). GUANAJUATO: *Dugès* (Gr.). FEDERAL DISTRICT: *Berlandier*, no. 696 (Gen., Par., BM.); *Seler*, no. 5265 (Gr.). PUEBLA: *Nicolas* (Gr.).

Although treated by Schultz as a distinct species this seems scarcely more than a vaguely and artificially separable narrow-leaved form of *S. serrata*.

Var. δ. **ivaefolia** (Willd.) Robinson, comb. nov. Leaves broader, lanceolate to oblanceolate-oblong or even oval, subentire or more often crenate-serrate at least above the middle, sparingly hirtellous to rather densely incurved-puberulent, the base cuneate and entire.—*S. ivaefolia* Willd. Gesellsch. Naturf. Fr. Berlin, Mag. i. 137 (1807). *S. lanceolata* Lag. Gen. et Spec. Nov. 26 (1816); Reichenb. Ic. Hort. (Ic. Exot.) 32, t. 185 (1828). *S. canescens* HBK. Nov. Gen. et Spec. iv. 143 (1820). *S. microcephala* DC. Prod. v. 118 (1836) in part, namely as to the specimen with round-tipped leaves on the type sheet, but not as to the other two specimens, which have ovate-lanceolate acuminate leaves and are presumably *S. rhombifolia* HBK. *S. tephra* Robinson, Proc. Am. Acad. xxxv. 328 (1900), as to material described though by accident some material of *S. rhombifolia* HBK. was mixed with the type-number (Pringle's no. 8229) when it was distributed.

UNITED STATES: grassy slopes, etc., mountains of southern New Mexico and southern Arizona.

MEXICO: COAHUILA: San Lorenzo Cañon, *Palmer* (coll. of 1904) 409 (Gr., K.). SAN LUIS POTOSI: *Parry & Palmer*, no. 325 (Gr., where mixed with var. γ.); in sandy places, *Schaffner*, no. 245 (Gr.); Alvarez, *Palmer* (coll. of 1902) 116 (Gr.); Guascama, *Purpus*, no. 4829 (Gr., Par., BM.). GUANAJUATO: *Humboldt & Bonpland* (Par., phot. Gr.). QUERÉTARO: *Agniel*, no. 10,615 (Gr.). HIDALGO: Sierra de Pachuca, *Pringle*, no. 8229 in part (Gr., Par., K.)—a number with which some *S. rhombifolia* was inadvertently mixed in the distribution; Cuyamaloya, alt. 2440 m., *Pringle*, no. 8798 (Gr.); Cerro Ventosa above Pachuca, *Pringle*, no. 7965 (Gr.). PUEBLA: dry oak forests, San Luis, *Purpus*, no. 3034 (Gr.). CHIAPAS: near San Cristobal, *E. W. Nelson*, no. 3141 (Gr., U. S.).

GUATEMALA: Dept. Sololá: on sunny slopes, Los Encuentros, *Seler*, no. 2356 (Gr.).

Though usually distinguishable by its leaf-form from var. α. no differences of specific value have been found either by Schultz, by Gray, or by the writer. It may be mentioned that the corolla-color, though prevailingly white as in var. α., tends at times more strongly to pink than is usual in the latter. *S. ivaefolia* was originally based on cultivated material. This had probably been influenced by selection and artificial conditions of growth and had developed a looser inflorescence than is usually found in the wild stock.

Var. ε. **haplopappa** Robinson. Leaves (opposite or scattered) oblong, obtusish to rounded at tip, crenate-serrate above the middle, cuneate and entire toward the base, in size, form and texture closely as in the preceding variety; pappus for the most part coroniform and exaristate though an awn or two may be found in a very few of the heads.—Contrib. Gray Herb. xc. 21 (1930).

MEXICO: Durango: near the City of Durango, *Palmer* (coll. of 1896) 750 (Gr., U. S.). Aguas Calientes: near the City of Aguas Calientes, *Rose & Hay*, no. 7752 (Gr.).

Seemingly no more than an exceptional and almost awnless form of an habitually awned species.

39. **S. connata** Lag. Smooth virgate leafy-stemmed perennial 6–9 dm. high; stem brownish purple, subterete, with white pith; leaves opposite, sessile, cordate-amplexicaul, lance-oblong to ligulate, attenuate, obscurely serrulate from the middle, conduplicate, 3-nerved from the base; subcoriaceous, pale green, mostly 5–10 cm. long, 8–15 mm. wide, those of each pair slightly connate at the insertion; corymb terminal, compound, fastigiate, flat-topped, rather dense; heads sessile or short-pedicelled, about 12 mm. long; phyllaries acute, glabrous, pale green, 6 mm. long; corollas white, conspicuously gland-dotted on the outside; achenes 3 mm. long, surmounted by a crown of erose subconnate scales 0.5 mm. high together with mostly 3 awns on each of the 4 adelphocarps and 1 on the idiocarp; awns about 5 mm. long, pale, scabrid.—"*Elench. H. R. M. ann.* 1805" acc. to Lag. Gen. et Spec. Nov. 27 (1816), where probably first really published. *S. umbellata* Alam. "in litt. 1831" and *S. viminea* Schrad. "Hort. Goett. 1832" acc. to DC. Prod. v. 117 (1836). *S. glabra* and *S. longifolia* Moc. ex DC. l. c. 117, 118, in synon.

MEXICO: Michoacan: grassy glades near Patzcuaro, *Pringle*, no. 4580 (Gr., Par., BM.). Vera Cruz: Zuguitlan, region of Orizaba, *Bourgeau*, no. 3243 (Gr., K., Gen., Copenh., U. S.). Morelos: mountainside above Cuernavaca, *Pringle*, nos. 7950 (Gr.), 9986 (Gr.). Oaxaca: *Ghiesbreght* (Gen.); alt. 1750 m., *Conzatti & Gonzáles*, no. 46 (Gr.); Cerro de San Felipe, alt. 2240 m., *Conzatti*, no. 716 (Gr.). Chiapas: Hacienda Monserrate, *Purpus*, no. 9123 (Gr.).

40. **S. Rosei** Robinson. Erect apparently herbaceous perennial (the base unknown); stem brownish, finely appressed-puberulent; leaves opposite (except the uppermost), sessile, oblong, subcoriaceous, shallowly crenate-serrate above the middle, narrowed to an obtusish tip, rounded at the entire base, bright green on both surfaces, appressed-puberulent above, glabrous beneath, about 7-nerved, 2.5–3.2 cm. long, 8–10 mm. wide; the nerves prominent especially beneath

and somewhat connected by prominent cross veins; heads about 1 cm. long, subsessile or shortly pedicelled in fastigiate conspicuously bracteate glomerules; phyllaries lance-linear, acute, nearly smooth, 7.5–10 mm. long; corollas with purplish throat and whitish spreading lobes; achenes black, 3.7 mm. long, alike or nearly so, each with a short scarious cup of connate scales and 1–2 slender awnlets (about 1–2 mm. long).—Proc. Am. Acad. xxxv. 327 (1900).

MEXICO: Jalisco: on the Sierra Madre, west of Balaños, *Rose*, no. 2994 (Gr.).

Among the North American Stevias this species is exceptional in the form of its pappus, which rather closely resembles that of some of the extra-tropical South American members of the genus.

41. **S. linearifolia** Walp. Erect, puberulent, herbaceous, opposite-branched; stem terete, striate, smooth; leaves opposite, sessile, linear-lanceolate, acuminate at each end, entire, 5–9 cm. long, 4 mm. wide; corymbs terminal, fastigiately many-headed; phyllaries ovate, obtusish; achenes slender, striate, crowned by a very short subentire coroniform pappus.—Linnaea, xiv. 320 (1840).

MEXICO: without more definite locality, *Karwinsky*.

An obscure species, not seen by the writer; the character here condensed from the original description, which, if accurate, would seem to preclude the reference of the plant to any other known species. Information of any specimen fitting the character would be greatly appreciated.

42. **S. neurophylla** Robinson & Greenman. Erect slender herbaceous perennial 3–6 dm. high, glabrous or nearly so up to the inflorescence; stem subterete, virgate or sparingly branched, purple; leaves opposite, sessile, linear or narrowly oblong, many-ribbed, acutish, entire, concolorous, green on both surfaces, 2–5 cm. long, 2–5 mm. wide, erect, the lower exceeding, the upper much shorter than the internodes; heads subsessile in a terminal subcapitate cluster, 13 mm. long; phyllaries narrowly lance-oblong, acute, of firm texture, pale green, glandular-puberulent; corolla white, almost smooth; proper tube 1.5 mm. long; throat slightly and gradually expanded, 5 mm. long; teeth ovate, acutish, 2.4 mm. long; achenes dark, hispid on and between the light-colored ribs, nearly uniform; pappus a crown of blunt erose scales (1.2 mm. long) and 5–6 purple-tinged upwardly scabrous awns (6.5 mm. long).—Proc. Am. Acad. xxxv. 327 (1900).

MEXICO: Guerrero: between Ayusinapa and Petatlan, *E. W. Nelson*, no. 2133 (Gr.).

43. **S. pelophila** Blake. Erect virgate perennial herb, 2.5–3 dm. high; root a fascicle of elongated slender tough dark fibres; stem slightly appressed-puberulent above; leaves opposite, sessile, linear, obtuse, entire, carneous, 1-nerved, smooth, 2–4 cm. long, 1–2 mm. wide, at first erect, the lower at length deflexed; corymb terminal, irregularly branched, few(4–7)-headed; pedicels 3–10 mm. long; heads 10–12 mm. long; corollas pale pink, 5–6 mm. long; throat scarcely differentiated; achenes all crowned with blunt erose scales about 0.8 mm. long, but heterocarpous as to their awns, these in the adelphocarps being 3(–2) in number, but in the idiocarp reduced to 2 much shorter ones (scarcely 2 mm. in length).—Contrib. U. S. Nat. Herb. xxii. 589 (1924).

MEXICO: DURANGO: in mud, alt. 1000 m., *García*, no. 387 (U. S., phot. Gr.).

44. **S. origanoides** HBK. Erect herbaceous or suffrutescent perennial, spreadingly branched above, 6–12 dm. high; stem slender, terete, brown to purple, incurved- or crisped-puberulent; pith white; leaves opposite, sessile, lanceolate, finely and often somewhat remotely serrate from about the middle; the cauline attenuate both ways, green on both surfaces, 3-nerved, puberulent on both sides at least along the nerves, punctate, softly membranaceous to somewhat thickish and harsh in texture, 4–7 cm. long, 8–17 mm. wide; the rameal smaller, subentire, often blunter-tipped; heads about 9 mm. long, shortly pedicelled in paniculately disposed terminal fastigiate glomerules (1–4 cm. in diameter); corollas with short hispidulous proper tube, subcylindric white or less frequently purple throat (3.2 mm. long) and spreading white lobes; achenes heteromorphic; adelphocarps coronulate and 2–3-aristate; idiocarp merely coronulate.—Nov. Gen. et Spec. iv. 147 (1820); Sch.-Bip. Linnaea, xxv. 277 (1853), only in part; Hemsl. Biol. Cent.-Am. Bot. ii. 88 (1881), at least in part.

MEXICO: COLIMA: *Palmer*, no. 1240 (Gr.). JALISCO: rocky hills near Guadalajara, alt. 1525 m., *Pringle*, no. 11,582 (Gr.); Rio Blanco, *Pringle*, no. 11,897 (Gr., U. S.). Either GUANAJUATO: Valle de Santiago, *Humboldt & Bonpland* (Par., phot. and sk. Gr., Brl., sk. Gr.), as recorded by Kunth in HBK. l. c. or MICHOACAN: Morelia ("Valladolid") according to label of type in herb. Mus. Nat. Hist. Paris. MORELOS: sides of barrancas near Cuernavaca, alt. 1525 m., *Pringle*, no. 6193 (Gr.); hills near the same city, alt. 1680 m., *Pringle*, no. 9980 (Gr.); mountainside near Parque Station, alt. 2290 m., *Pringle*, no. 8703 (Gr., U. S.), where mixed with narrow-leaved *S. rhombifolia?*

Schultz, though he maintained this species as valid, stated that it was identical with *S. ovata* Lag., an inference which the writer cannot accept.

The Colima and Jalisco specimens here referred to *S. origanoides*

have somewhat more densely puberulent leaves tending to harsher texture. They would be placed in *S. scabridula* (described above) but for their opposite and lanceolate rather than alternate and oblanceolate cauline leaves.

45. **S. dissitifolia** DC. Erect herbaceous perennial 3 dm, or more in height; stem slender, smooth; internodes elongated (some of them exceeding 7 cm. in length); leaves (only the upper ones known), opposite or nearly so, elliptic or oblong, quite entire, narrowed to an obtusish apex, cuneate at base, 8–15 mm. long, 6–8 mm. wide; inflorescence terminal, leafy-bracted, the wide-spreading branches naked for two-thirds their length, each bearing a rather compact terminal cluster of 7–12 sessile or shortly pedicelled heads (10.5 mm. long); phyllaries oblong, acute, 6 mm. long, densely beset with a short spreading glandular puberulence; corollas finely granular, the proper tube 1.2 mm. long, the perceptibly enlarged throat 4 mm. long; teeth slightly hispid; achenes all crowned by a short cup of more or less connate scales (0.3 mm. high), the 4 adelphocarps each having also 3–6 slender awns (5 mm. long) and the idiocarp being awnless.—Prod. v. 121 (1836), in part, namely as to plant from herb. of von Martius.

MEXICO: without stated locality (Gen., phot. Gr.).

A slightly known and puzzling species, founded on mixed material thought to be of Mexican origin but possibly from South America. For detailed discussion see p. 10.

46. **S. hirtiflora** Sch.-Bip. Herbaceous or possibly somewhat lignescent, known only from a short slightly curved upper end of a flowering stem or more probably lateral branch of a compound inflorescence; leaves (only 2 pairs shown) opposite, sessile, oblanceolate-oblong, 3-nerved, crenately 2–3-toothed near the bluntish apex or subentire, 8–12 mm. long, 3–5 mm. wide, thick, of firm texture, dark-punctate and sparingly crisped-puberulent; heads sessile in glomerules; these terminal on the branches of a presumably corymbose leafy-bracted and somewhat openly branched panicle; phyllaries narrowly oblong, acute, beset with white glandless tapering incurved hairs and a few sessile glands; corollas densely hirtellous; the proper tube and limb white or nearly so; the throat violet toward the summit; achenes slightly roughened; pappus coroniform, exaristate.—Linnaea, xxv. 274 (1853).

MEXICO: Hidalgo: near Regla, *Ehrenberg*, no. 30 (Par., sk. and notes Gr.).

This species, obscure and confused almost from the start, is represented in the herbarium of Schultz (acquired by Cosson and now at

the Museum of Natural History in Paris) only by a fragment of the type number, Ehrenberg's no. 30. With this, Schultz himself later associated Liebmann's no. 133 and Schaffner's no. 427 both of which are referable to *S. elongata* HBK. as here interpreted. They have ovate somewhat petiolate leaves and have phyllaries beset with stipitate glands. It is certain they can have nothing to do with the real type (the fragment of Ehrenberg's no. 30) which Schultz took to be a pygmy species 3¼ inches high, but which seems pretty certainly to be only the upper part of a lateral slightly curved branch in the compound leafy-bracted terminal inflorescence of a much taller plant. As to the form and texture of its leaves the writer has found no precise match for this fragment. It may well prove a distinct species, perhaps restricted to the areas of cactus-rich vegetation specially sought and explored by Ehrenberg. Certainly its somewhat thickened leaves suggest xerophytic habit.

47. **S. Karwinskyana** Steud. Said to be a subsimple pubescent herb with opposite sessile lanceolate acuminate 3-nerved leaves (3.6–5 cm. long and 8–14 mm. wide), glabrous above, puberulent and glaucous beneath, a terminal opposite-branched corymb, linear-lanceolate bracts, subacute linear phyllaries, white corollas, glabrous achenes 2 mm. long, and subentire coronulate pappus.—Nom., ed. 2, ii. 641 (1841). *S. lanceolata* Walp. Linnaea, xiv. 319 (1840), neither Lag., nor H. & A., nor Moc.

MEXICO: *Karwinsky* acc. to Walpers, l. c.

Of this obscure species the writer has seen no authentic material. Most of the traits called for by its original diagnosis are fairly well met by Purpus's no. 2856 (Gr.) from steep wet rocks in the Barranca de Tenampa, State of Vera Cruz (a dwarf plant 1.5–2 dm. high), but the leaves of the Purpus specimen have a minute puberulence on the upper surface and are essentially glabrous beneath.

48. **S. Plummerae** Gray. Erect puberulent perennial herb 3.5–7 dm. high; root a fascicle of numerous long slender tough dark fibres; stem subterete, usually reddish, equally leafy throughout, seldom branched below the middle; leaves opposite (a few of the upper sometimes alternate), sessile, oblong or oblong-lanceolate, acute or acutish, toothed from near the middle, cuneate to rounded at base, 3–7(–9) cm. long, 5–25 mm. wide, the cauline often deflexed; corymb terminal, flat-topped, fastigiately branched, 4–15 cm. in diameter; heads subsessile to distinctly pedicelled; phyllaries linear-lanceolate, subappressed-puberulent and sprinkled with sessile glands; achenes awnless but surmounted by an irregularly toothed hyaline cup (often fully 1 mm. high) of connate pappus-scales.

KEY TO VARIETIES.

Leaves firmly membranaceous or even subcoriaceous, sparingly hirtellous; veins prominently exserted on both surfaces, conspicuously reticulated; heads at anthesis 10–12 mm. long.
Corolla-throat purple; limb purple to pale rose.....Var. *α. typica.*
Corolla white.....Var. *β. alba.*
Leaves membranaceous, finely but rather closely appressed-puberulent above, softly grayish-villulose beneath: heads at anthesis 8–10 mm. long.....Var. *γ. durangensis.*

Var. *α.* **typica.** An upright slightly xerophytic herb with pale green almost concolorous scarcely pubescent leaves of firmish texture and with coarsely netted veins prominent on both surfaces.—*S. Plummerae* Gray, Proc. Am. Acad. xvii. 204 (1882) and Syn. Fl. i. pt. 2, 92 (1884). *S. madrensis* Gray, Proc. Am. Acad. xxi. 382 (1886).

UNITED STATES: NEW MEXICO: *Rusby*, no. 157 in part (Gr.). ARIZONA: Huachuca Mts., *Mr. & Mrs. Lemmon*, no. 2730 (Gr.), *Pringle*, no. 17 (Gr.); Ramsey Cañon, Huachuca Mts., *Jones*, no. 25,065 (Gr.); Santa Catalina Mts., *Shreve*, no. 5400 (Gr.); Chiricahua Mts., in recent pine clearings, *Blumer*, no. 1344 (Gr., K.); Rincon Mts., *Blumer*, no. 3320 (Gr.); Willow Spring, *Palmer* (Gr.).
MEXICO: CHIHUAHUA: Sierra Madre, *Pringle*, nos. 1260 (Gr.), 1615 (BM.); southwest part of state, *Palmer*, no. 328 (Gr., BM., K.); base of Mt. Mohinora, *E. W. Nelson*, no. 4860 (Gr.); near Colonia Garcia, *E. W. Nelson*, no. 6264 (Gr.), *Townsend & Barber*, nos. 310 (Gr.), 311 (G., K., BM.) and 345 (Gr.). DURANGO: Mesa de la Sandia, *Pringle*, no. 13,572 (Gr.).

Var. *β.* **alba** Gray. Closely similar to var. *α.* in habit and foliar characters; corollas with limb and upper part of throat clear white, the lower part of throat and proper tube yellowish or greenish white.—Syn. Fl. i. pt. 2, 92 (1886).

UNITED STATES: SOUTHERN ARIZONA: near Fort Huachuca, *Lemmon*, no. 2731 (Gr., Gen., Par., K.).
MEXICO: CHIHUAHUA: on sierra south of Guadalupe y Calvo, *E. W. Nelson*, no. 4795 (Gr.).

Var. *γ.* **durangensis** Robinson. More mesophytic; leaves somewhat larger, 6–9 cm. long, less firm in texture; the netted veins scarcely exserted above, finely grayish-pubescent beneath; heads smaller, 8–10 mm. long; corollas white as to limb and upper part of throat.—Proc. Am. Acad. xliii. 29 (1907).

MEXICO: DURANGO: barranca below Sandia Station, alt. 2135 m., *Pringle*, no. 10,106 (Gr., BM., K.).

49. **S. venosa** Gray. Erect nearly glabrous perennial herb 3–5 dm. high; stems (sometimes several) from a thickish woody caudex, terete, red, leafy to the summit; leaves opposite, subsessile, oblong-ovate, acute at both ends, obscurely and remotely serrulate from near the

middle, coriaceous, reticulated on both surfaces, 3–7 cm. long, 1–2.2 cm. wide, the lower exceeding, the upper usually about equalling the internodes; corymb terminal, opposite-branched, moderately convex, 4–11 cm. in diameter, the partial inflorescences compact; heads 5(–6!)-flowered, sessile or shortly pedicelled, 8–10 mm. long; bractlet lanceolate, 3–4 mm. long; phyllaries oblong, acute, pale green, often purple-tinged near the tip, incurved-puberulent; corollas deep rose, nearly smooth, the proper tube slender, 1 mm. long, throat slightly enlarged, 4 mm. long, the limb spreading, paler rose to almost white, slightly hispid; achenes alike, exaristate and crowned with a short subentire cup.—Proc. Am. Acad. xxi. 382 (1886).

MEXICO: Chihuahua: about 150 miles north of Batopilas, *Palmer* (coll. of 1885) 376 (Gr., K., BM.); foothills of the Sierra Madre, *Pringle*, nos. 1261 (Gr., K.), 1616 (BM.); between Parral and Batopsis, *Goldman*, no. 119 or 169? (Gr.); near Colonia Garcia, alt., about 2200 m., *Townsend & Barber*, no. 344 (Gr., K.).

50. **S. pubescens** Lag. Suberect perennial herb with simple terete pubescent to somewhat hirsute stem; lower leaves opposite, lanceolate-spatulate, narrowed into a petiole, dentate near the tip, the upper scattered, linear, subentire, slightly broadened toward the apex; corymb fastigiate, rather dense; involucre pubescent; corollas crimson; pappus of 3 short truncate scales alternating with 3 awns.—Gen. et Spec. Nov. 26 (1816), not HBK.

MEXICO: Guanajuato: about the city of Guanajuato, *Neé*, according to Lagasca, l. c.

This is another still obscure species. By Schultz (Linnaea, xxv. 285) it was doubtfully referred to *S. eupatoria* Willd., but that has a merely puberulent stem and its leaves alternate or scattered almost from the base, the upper not at all broadened toward the tip. The writer has seen no entirely convincing material of *S. pubescens* Lag. It is quite possible, however, that the plant may be readily rediscovered by a more careful exploration of the still very imperfectly known region about Guanajuato, and may prove to be a good species.

51. **S. clinopodioides** Greenman. Erect from a slightly decumbent base, herbaceous, perennial, 2.5–3.5 dm. high; root a fascicle of many tough dark elongated unthickened fibres; stems (1–3) terete, dark purple, incurved-puberulent, leafy to the summit; leaves opposite, oblanceolate-oblong, mostly conduplicate, serrate from the middle to an acutish tip, cuneate and entire toward the base, thickish-membranaceous, nearly smooth, dark-punctate on the distinctly paler under surface, 3–3.5 cm. long, 7–10 mm. wide; corymbs terminal, con-

vex, congested, 2–4 cm. in diameter; heads 10.5 mm. long, sessile or nearly so; phyllaries oblong-linear, acute, dark purple, 7 mm. long, pubescent; corollas purple, smoothish; proper tube 1.5 mm. long; throat distinctly enlarged, 2.5 mm. long; teeth ovate, rounded at tip; achenes heterocarpous; crown of erose more or less connate hyaline scales, 0.4 mm. high; one of the 5 achenes in each head bearing also 1–2 slender awns (3.5 mm. in length).—Proc. Am. Acad. xxxii. 307 (1897).

MEXICO: Federal District: Serrania de Ajusco, alt. about 2900 m., *Pringle*, no. 6594 (Gr., Par., K., Brl.); lava fields near Cima Station, alt. 3050 m., *Pringle*, no. 11,578 (Gr., K., Brl.). Vera Cruz: side of Mt. Orizaba, *Rose & Hay*, nos. 5715 (U. S., fragm. Gr.) and 6351? (U. S.). Puebla: Boca del Monte, *Purpus*, no. 2552 (Gr.)?

52. **S. Palmeri** Gray. Erect gray-pubescent to tomentose sub-lignescent perennial 4–6 dm. high; leaves (except some of the floral) opposite, oblanceolate-oblong, obtuse to rounded at the apex, gradually narrowed to a short petiole, crenate-serrate from below the middle, 2.5–4.5 cm. long; 7–15 mm. wide, 3-nerved above the base; corymbs terminal, opposite-branched, large, flattish-topped; heads pedicellate, rather small, 7 mm. high; phyllaries densely gray-pubescent; corollas white to slightly ochroleucous, the proper tube spreading-villous, almost as long as the turbinate-campanulate smoothish throat; achenes heterocarpous, all bearing an irregularly toothed hyaline cup (0.5 mm. high) and 2 of them being 3-awned.—Proc. Am. Acad. xxi. 382 (1886).

MEXICO: Southwestern Chihuahua: on mountainsides about 25 miles south of Batopilas, near Hacienda San José, *Palmer* (coll. of 1885) 30 (Gr., K., BM.); near Chuichupa in the Sierra Madres, *Townsend & Barber*, no. 419 (Gr., K., BM.); rocky hills near Chihuahua, *Pringle*, no. 602 (Gr.).

53. **S. ovata** Willd. Erect much branched perennial with fascicle of unthickened fibrous roots and slender purple-tinged obscurely puberulent stem; leaves opposite or (especially the upper) clearly alternate, ovate to rhombic- or lance-oblong, the lower distinctly petioled, the upper and floral sessile or nearly so, obtuse to acutish, cuneate at base, mostly 3–7-toothed on each side above the middle, membranaceous to slightly carneous, gland-sprinkled, punctate and slightly paler beneath, 3-nerved, mostly 3–4.5 cm. long and 1–2 cm. wide; panicle ample, compound, flattish-topped, rather loose; heads pedicellate, 8–10 mm. long; phyllaries oblong, acutish, green, incurved-puberulent and gland-sprinkled; corollas white; achenes heteromorphous; all crowned with short scales, but usually only 3 bearing (2–)3 awns each. —Enum. Hort. Berol. 855 (1809); Hornem. Hort. Hafn. ii. 793 (1815);

Lag. Gen. et Spec. Nov. 27 (1816), where the name is traced back to an apparently unpublished "*Elench. H. R. M. ann.* 1805"; Reichenb, Ic. Bot. Exot. ii. 31, t. 184 (1828). *S. paniculata* Lag. l. c. *S. hyssopifolia* Sims, Bot. Mag. t. 1861 (1817), not Cav. *S. erecta* Walp. Rep. ii. 548 (1843), by clerical error.

S. ovata Willd. appears to be the earliest published name for this plant, thought to be of Mexican origin, which was pretty widely cultivated during the earlier decades of the 19th century. Though lacking sharp differential characters it is in general recognizable in old cultivated material to be found in most large herbaria, but even yet it has not been convincingly matched with material from the wild. A specimen from herb. of Klatt (Gr.) labelled "in umbrosis circa Mexico" is probably the same, but may be a mere remnant of garden material. Schaffner's no. 242 (Gr.) from mountains near Morales, San Luis Potosi, has suggestive similarity, but may be only a loosely panicled strain of the nearly related *S. rhombifolia* HBK. The same is true of Bourgeau's no. 819 from the Valley of Mexico.

In Coahuila there occurs what may be taken for an awnless variety of *S. ovata* with somewhat larger leaves. It is represented by *Palmer* ('80) 439 from Parras and *Pringle*, no. 2809 from Carneros Pass. With equal plausibility this form may be regarded as phase of *S. rhombifolia* var. *stephanocoma* with heads slightly larger and more scattered than usual.

54. **S. rhombifolia** HBK. Erect herbaceous perennial or suffrutescent or even at times distinctly fruticose plant, 6–12 dm. high, single-stemmed, sometimes virgate but usually having several pairs of opposite branches above the middle; stem terete, tending to become purple, finely incurved- or crisped-puberulent, leafy to the inflorescence; leaves opposite (the uppermost often subalternate), acutish to acuminate, crenate-serrate from below the middle, entire toward the gradually narrowed sessile or shortly petioled base, hirtellous to rather copiously pubescent on both surfaces, 2–6(–9) cm. long, 1.5–2.5 (–4) cm. wide; heads 6–9 mm. long, sessile or short-pedicelled in compact glomerules disposed in a convex compound panicle; phyllaries narrowly oblong, acute, mostly pale green, incurved-puberulent and sprinkled with sessile glands, sometimes purple-tinged and rarely subglabrous, 4–5.7 mm. long; corollas white or more rarely roseate to deep purple; achenes bearing a crown of short erose scales with or without 1–4 often dark violet awns about equalling the corollas.—Nov. Gen. et Spec. iv. 143 (1820); Sch.-Bip. Linnaea, xxv. 278 (1853). *S. quitensis* HBK. l. c. 145 (1820); Benth. Pl. Hartw. 197 (1845). *S. ternifolia* HBK. l. c. 146 (1820), merely a casual ternate-leaved

form without other distinctions. *S. triflora* DC. Prod. v. 115 (1836), a form mistakenly separated because of its supposedly 3-flowered heads, which are in fact 5-flowered. *S. fasciculatis* Less. Linnaea, v. 140 (1830). *S. Benthamiana* Hieron. in Engl. Bot. Jahrb. xxviii. 561 (1901).

S. rhombifolia HBK. appears to be the oldest verifiable name for this, probably the most abundant, wide spread, and variable species of the genus. In stature, robustness and degree of lignescence, in breadth of leaf and length of petiole, particularly in pubescence, corolla-color and pappus this species, while retaining a general uniformity of habit, shows such variability that it might conceivably be divided and repeatedly subdivided into many fairly plausible forms. However, these for the most part would represent only chance combinations of independent variables. It is believed that the following key, based on the most obvious traits, will give subdivision adequate for all ordinary purposes.

KEY TO VARIETIES AND FORMS.

a. Most of the achenes in each head 3 (1–4)-awned . . . . *b*
  b. Corollas white or nearly so (the tube often yellowish or greenish) . . . . . Var. *α. typica.*
  b. Corollas deep rose to purple . . . . . Var. *α. typica*, f. *colorata.*
a. Most of the achenes awnless but 1 (or more rarely 2) in some of the heads bearing a usually solitary awn . . . . . Var. *β. uniaristata.*
a. Achenes all merely coronulate and awnless . . . . *c.*
  c. Corollas white or nearly so (the tube often yellowish or greenish) . . . . . Var. *γ. stephanocoma.*
  c. Corollas deep rose or purple at least as to the throat and mostly as to the lobes also . . . . . Var. *γ. stephanocoma*, f. *glandulifera.*

Var. *α.* **typica**. Corollas as to throat and limb white or nearly so; pappus at least of the 3–4 adelphocarps composed of short erose-dentate often connate scales and 1–4 (mostly 2–3) awns about equalling the corolla.—Literature and synonymy as above.

MEXICO: along mountain streams, in open woods, and sometimes on exposed hillsides, chiefly at middle altitudes and in the states of Durango, San Luis Potosi, Querétaro, Jalisco, Michoacan, Mexico and Federal District, Morelos, Puebla, Vera Cruz, Oaxaca, and Chiapas.

GUATEMALA: Departments Huehuetenango, Sacatepéques, and Santa Rosa.

[SOUTH AMERICA: at least at scattered points in northern, central, and southwestern Colombia, as well as in central Ecuador.]

Forma **colorata**, forma nov. Corollas as to throat and usually as to lobes deep rose to purple; otherwise like the typical form.

MEXICO: DURANGO: near the city, *Palmer* ('96) 958 (Gr.). FEDERAL DISTRICT: near Eslava, alt. 2380 m., *Pringle*, no. 1480 (Gr.); Guadalupe, *Rose*

& Painter, no. 7284 (Gr., U. S.). PUEBLA: moist hillsides, *Purpus* no. 2786 (Gr.).

Much less common than the typical white-flowered form.

Var. **uniaristata** (DC.) Sch.-Bip. Pappus-awns to some extent present but rarely more than one to a head and occurring only in scattered heads of the inflorescence; corollas white or nearly so.—Sch.-Bip. Linnaea, XXV. 279 (1853). *S. uniaristata* DC. Prod. v. 120 (1836).

MEXICO: GUANAJUATO: in mountains near Leon, *Mendez* (Gen., phot. Gr.). JALISCO: Guadalajara, *Palmer* ('86) 493 (Gr.).

A rare and unimportant variety but rather interesting as showing indubitable transition between the far more abundant awn-bearing and awnless varieties of the species.

Var. γ. **stephanocoma** Sch.-Bip. All the achenes awnless and merely coronulate with short scarious erose-dentate and more or less connate scales; corollas white or nearly so though often with yellowish or greenish-white tube and throat.—Linnaea, XXV. 279 (1853). *S. compacta* Benth. Pl. Hartw. 197 (1845).

MEXICO: open woods, bushy slopes, mountainsides, and grass land at middle altitudes in the states of Guerrero, Michoacan, Mexico, Puebla, Oaxaca, and Chiapas.

GUATEMALA: in pine woods, etc., in Departments of Alta Vera Paz, Santa Rosa, and doubtless elsewhere.

HONDURAS: in pine woods, Dept. of Comayagua.

COSTA RICA: apparently common and entirely replacing the awn-bearing forms.

PANAMA: on savannahs, Eastern Chiriqui, alt. 900–1100 m., *Pittier*, no. 5297 (Gr.).

[SOUTH AMERICA: mountains of northern and western Venezuela; Colombia; northern Peru.]

Forma **glandulifera** (Schlecht.), comb. nov. In habit, stature, foliage and pubescence closely similar to var. α. but with corollas deep rose-colored to rich purple and achenes awnless.—*S. glandulifera* Schlecht. Ind. Sem. Hort. Hal. 19 (1839), & Hort. Hal. 15, t. 8 (1841); Walp. Rep. ii. 547 (1843). *S. trachelioides* Hook. Bot. Mag. t. 3856 (1841), not DC. *S. tephra* Robinson, Proc. Am. Acad. XXXV. 328 (1900), as to Pringle's no. 8229 in part, by mistake distributed as isotype material, not however as to plant described.

MEXICO: HIDALGO: Real del Monte, *Ehrenberg*, no. 477 (Brl.); mountains above Pachuca, alt. about 2900 m., *Pringle*, nos. 8219 (Gr.) and 8229 (Gr.); *Holway*, no. 3581 (Gr.); hills near Cuyamaloya Station, *Pringle*, no. 13,083 (Gr.). FEDERAL DISTRICT: lava fields near Cima Station, *Pringle*, no. 11,575 (Gr.); Valley of Mexico, *Pringle*, no. 7283 (Gr.). STATE OF MEXICO: Dos Rios, *Seler*, no. 1302 (Gr.). OAXACA: Cerro del San Felipe, *E. W. Nelson*,

no. 1093 (Gr.); Oaxaca, *Conzatti & González*, no. 1018 (Gr.). PUEBLA: Atlixco, *Bro. Nicolas*, no. 10,160 (U. S.).

The name *glandulifera*, alluding to the stipitate glands on the corolla, is a bit unfortunate, since, as subsequently noted by its author (Hort. Hal. 15), it stresses a trait rather common in the genus and by no means peculiar to this species.

55. **S. tomentosa** HBK. Erect herbaceous perennial 3–6 dm. high; stem terete, usually brown to dark purple, canescent-tomentellous, leafy; leaves (the lower opposite and the upper often alternate), elliptical to broadly oval, obtuse, finely serrate or crenate-serrate, narrowed at base to a short but usually definite petiole, grayish-puberulent above, densely white-lanate beneath, 2.5–4.5 cm. long, 1–2(–4) cm. wide, often deflexed; corymb terminal, convex, dense, 5–20 cm. in diameter; heads sessile or nearly so, 9 mm. in length; phyllaries narrowly oblong, rounded to acute at tip, dorsally puberulous and gland-sprinkled or canescent-lanulate; corollas white or (as to throat) rose-colored or purple; achenes usually heteromorphic, all coronulate; adelphocarps 4, mostly 3-awned; idiocarp awnless or 1-awned.—Nov. Gen. et Spec. iv. 145, t. 352 (1820); Sch.-Bip. Linnaea, xxv, 281 (1853).

MEXICO: COAHUILA: pine woods, Carneros Pass, *Pringle*, no. 2854 (Gr.); San Lorenzo Cañon near Saltillo, *Palmer* ('04) 414 (Gr., K.). HIDALGO: El chico near Pachuca, *Purpus*, no. 1477 (Gr.). MICHOACAN: Morelia, *Humboldt & Bonpland* (Par., phot. Gr.). FEDERAL DISTRICT: base of Sierra de Ajusco, alt. 2375 m., *Pringle*, no. 6622 (Gr., Par., K., BM.); brooksides, Tlalpam, *Seler*, no. 4151 (Gr.); Valley of Mexico, *Schaffner* (Gr.), *Lemmon*, no. 136 (Gr.). STATE OF MEXICO: gravelly banks, base of Nevado de Toluca, *Pringle*, no. 4282 (Gr., Par., K., BM.); hills near El Salto, alt. 2135 m., *Pringle*, nos. 9985 (Gr., K.) and 11,588 (Gr., K.). PUEBLA: Esperanza, *Purpus*, no. 2550 (Gr.); Teocalli de Cholula, *Bro. Nicolas* (Gr.). OAXACA: Las Naranjos, *Purpus*, no. 3035 (Gr., BM.). CHIAPAS: temperate belt, *Ghiesbreght*, no. 579 (Gr.).

Var. **Seatonii** Robinson. In habit, foliage, pubescence, etc., closely resembling the typical variety, but having achenes uniformly exaristate and merely coronulate.—Contrib. Gray Herb. xc. 21 (1930).

MEXICO: PUEBLA: Atlixco, *Bro. Nicolas*, no. 10,159 (U. S.). VERA CRUZ: Maltrata, alt. about 1680 m., *Seaton*, no. 487 (TYPE, Gr.), originally determined and distributed as *S. leucantha* Schlecht., which however was described as having acute serrate-dentate leaves and was referred by Schultz (with probable accuracy) to the following species.

56. **S. nepetaefolia** HBK. Exceedingly close to the preceding species, but usually distinguishable at a glance on account of its slightly thinner, rhombic-ovate, more deeply, irregularly and incisely toothed as well as more acute leaves and slightly longer petioles;

achenes heteromorphous, the adelphocarps (3–4 in number) 2–4-awned, the idiocarp awnless.—Nov. Gen. et Spec. iv. 196 (1820). *S. tomentosa* Schauer, Linnaea, xix. 718 (1847), not HBK. *S. nepetifolia* Willd. ex Sch.-Bip. Linnaea, xxv. 280 (1853). *S. mollis* Schrad. ex DC. Prod. v. 120 (1836). *S. nepetaefolia* I. *mollis* (Schrad.) Sch.-Bip. l. c.

MEXICO: Hidalgo: Real del Monte, *Ehrenberg*, no. 199 (Par.). Federal District: Valley of Mexico, *Aschenborn*, no. 576 (Par.), *Schaffner*, nos. 258 (Par.) and 261 (Par.); lava fields above the Valley of Mexico, alt. 2440 m., *Pringle*, no. 9104 (Gr., K.); Guadalupe, *Rose & Painter*, no. 7285 (Gr., U. S.); Tlalpam, *Pringle*, no. 7279 (Gr.). State of Mexico: high plains near Lake Tezcuco, alt. 2750 m., *Humboldt & Bonpland* (Par.); between the desert and Sta. Lucia, alt. 2300 m., *Endlich*, no. 401 (Brl.). Guerrero: near Chilpancingo, alt. 2750–3050 m., *E. W. Nelson*, no. 2207 (Gr.).

Var. **leucantha** (Schlecht.) Sch.-Bip. Differing from the typical variety in having all its achenes awnless.—Linnaea, xxv. 280 (1853). *S. leucantha* Schlecht. Hort. Hal. 16 (1841).

MEXICO: Hidalgo (?): Puente de Dios, *Ehrenberg*, no. 775.
Not seen by the writer.

57. **S. Seemannii** Sch.-Bip. Erect herbaceous scabrous subscapose perennial 2–6 dm high; stem terete, dark purple, tomentose on the leafy basal portion; leaves opposite, petiolate, broadly ovate, very obtuse or rounded at the tip, crenate except on the cuneate petiolar portion, pale green or purple-tinged, beset on both surfaces with scattered white jointed hairs, thickish and of harsh texture, 2.2–4.5 cm. long, 1.5–3.5 cm. wide; the middle and upper leaves in (1–)2–3 remote pairs, much smaller; corymb terminal, convex, fastigiate, often trifid; heads subsessile to distinctly pedicellate, about 12 mm. long; phyllaries lance-linear, 7 mm. long, acute; achenes (so far as observed) homomorphous, each crowned with scales about 0.7 mm. long and 3 upwardly barbellate-scabrid awns nearly equalling the corollas.—Sch.-Bip. in Seem. Bot. Herald, 298 (1856).

A well marked species in which the following two varieties may be distinguished.

Var. α. **typica**. Phyllaries a rich purple, sparingly clothed with slender appressed glandless hairs; corollas deep crimson.

MEXICO: Oaxaca: Sierra de San Felipe, alt. 2135 m., *Pringle*, no. 4949 (Gr., Par., K., BM.); Oaxaca, alt. 1750 m., *Conzatti & González*, no. 1019 (Gr.). State unmentioned: Sierra Madre, *Seemann*, no. 2041 (K., Gr.).

Var. β. **Selerorum** Robinson. Phyllaries greenish, densely beset with short spreading mostly gland-tipped at length stiffish hairs;

corollas (in dried specimens) pale, as if white in nature.—Contrib. Gray Herb. xc. 20 (1930).

MEXICO: Oaxaca: between San Martin and Tlaxiasco, *Caec. & Edw. Seler*, no. 1602 (Gr.).

58. **S. cordifolia** Benth. Erect herbaceous pubescent perennial, simple and leafy to the inflorescence; leaves opposite, deltoid-ovate, acute, rather finely and evenly crenate-serrate almost from the broadly cordate base, long-petioled, thinly membranaceous, puberulent on both surfaces, dark-reticulate beneath; petioles slender; inflorescence with widely spreading slender opposite and alternate branches tipped by fastigiate few-headed clusters; heads distinctly pedicelled; phyllaries glandular-puberulent; corollas (known only from dried material) thought to be whitish; achenes heteromorphous; the 4 adelphocarps minutely hispidulous on the ribs and surfaces, crowned by an erose scarious collar 0.4 mm. high and 1–2 awnlets 0.6–0.9 mm. long; idiocarp hispid chiefly on the ribs, surmounted by a collar but lacking the awnlets.—Pl. Hartw. 39 (1840).

MEXICO: Hidalgo: Regla, *Hartweg*, no. 304 (K., phot. Gr.).

Known as yet only from the type material this species in habit resembles very closely *S. latifolia*, but in its achenes it is exceptional among the North American Stevias, for it has the pappus of type VI., which is characteristic of some of the extra-tropical South American species of the genus.

59. **S. latifolia** Benth. Erect herbaceous pubescent and glandular-puberulent perennial, 7–14 dm. high; leaves opposite, long-petioled, acute to acuminate, sharply and often coarsely dentate, pubescent or at least scabrid-puberulous on both surfaces, thinly membranaceous, mostly 4–5 cm. long and 3.5–4 cm. wide; petioles 2.5–3 cm. long, cuneately winged above; heads sessile or subsessile in compound terminal corymbs; corollas with roseate to purple throat and pink to white limb; phyllaries green or purple-tinged, glandular-puberulent; achenes homomorphous, all crowned with an erose collar and awnless.—Pl. Hartw. 40 (1840).

MEXICO: San Luis Potosi: *Palmer*, no. 320½ (Gr.). Michoacan: wooded hills near Patzcuaro, *Pringle*, no. 4581 (Gr.); Cerro de Azule, near Morelia, *Arsène* (Gr.). Guerrero: near Chilpancingo, alt. 2750–3100 m., *E. W. Nelson*, no. 2244 (Gr.). Hidalgo: Sanchez, *Hartweg*, no. 305 (K., phot. Gr.).

60. **S. hirsuta** DC. Erect or curved-ascending perennial hirsute herb, about 4 dm. high; stems simple, leafy to somewhat above the

middle; lower internodes about 1 cm. long, the uppermost 3–5 cm. in length; leaves opposite, ovate or ovate-lanceolate, obtuse, crenate-dentate except on the at first abruptly contracted then gradually narrowed entire petioliform base, hirsute on both surfaces, 2.5 cm. long, 2 cm. wide; corymbs terminal, round-topped, usually 3-parted; or pinnately 5–7-branched, the partial inflorescences rather dense; heads about 1 cm. long, sessile or shortly pedicelled; phyllaries narrowly oblong, acute, 5 mm. long, covered with soft scattered subappressed glandless hairs and a few sessile glands; corollas with tube and slender cylindrical throat gland-sprinkled, the limb purple and dorsally hispid; achenes heteromorphous, 3.5 mm. long, hispid on the ribs; the 4 adelphocarps 3-awned; the idiocarp merely coronulate with somewhat connate erose-dentate scales.—Prod. v. 120 (1836). *S. deltoidea* Greene, Pittonia, iii. 31 (1896).

MEXICO: STATE NOT ASCERTAINED: Villalpando at the southwest of Guanajuato, *Mendez* (TYPE, DC., phot. Gr.). MORELOS: Sierra de Tepoxtlan, alt. about 2790 m., *Pringle*, no. 9133 (Gr.). PUEBLA: pine forests around Honey Station, alt. about 1770 m., *Pringle*, no. 13,084 (Gr.); pine forests, Coxcatlan, alt. 2450–2750 m., *Purpus*, no. 4134 (Gr., BM.). OAXACA: Sierra de San Felipe, alt. about 2290 m., *Pringle*, no. 4976 (Gr.); mountains, Jayacatlan, *L. C. Smith*, no. 225 (Gr.); Oaxaca, alt. 1750 m., *Conzatti & Gonzáles*, nos. 43 (Gr.), 1017 (Gr.), and 1020 (Gr.).

61. **S. reglensis** Benth. Erect perennial herb, 6–9 dm. high; stem terete, crisped-puberulent, usually dark purple; leaves opposite, petiolate, broadly ovate, coarsely crenate, acutish to more often obtuse at apex, 5–6 cm. long, 3.8–4.3 cm. wide, sparingly pubescent on both surfaces especially along the nerves and veins, firmly membranaceous, slightly paler beneath; petiole 1–1.8 cm. long, cuneately winged toward the summit; corymb terminal, convex, fastigiate, often accompanied by lesser lateral corymbs; heads about 1 cm. long; phyllaries narrowly oblong, abruptly short-pointed, green, subappressed-hirtellous with delicate white glandless hairs and sprinkled with sessile glands; corollas white; achenes usually heteromorphous, 2–4 of them mostly bearing 1–2(–3) awns as well as short scales, the others merely coronulate with short scales and an occasional awnlet.—Pl. Hartw. 40 (1840); Hemsl. Biol. Cent.-Am. Bot. ii. 89 (1881) only as to pl. of Hartw.

MEXICO: HIDALGO: Regla, *Hartweg*, no. 308 (K., phot. Gr.). FEDERAL DISTRICT: barranca above Santa Fé, alt. 2440 m., *Pringle*, nos. 6530 (Gr.) and 7270 (Gr.); pine woods, base of Sierra de Ajusco, alt. 2380 m., *Pringle*, nos. 6619 (Gr.) and 7282 (Gr.).

Puzzling specimens mingling characters of this species with those of *S. jorullensis* or *S. rhombifolia* are sometimes encountered, suggesting occasional hybrids between these nearly related species.

62. **S. jorullensis** HBK. Erect or slightly decumbent herbaceous perennial, 3–9 dm. high; stem dark purple, finely crisped- or incurved-puberulent, sometimes nearly smooth, evenly leafy to the inflorescence or sometimes having the upper internodes elongated; leaves opposite, petiolate, ovate to suboblong-ovate, mostly obtuse, crenate to serrate except toward the entire at first abruptly contracted then cuneately narrowed base, 3–5(–6) cm. long, 1–3(–5) cm. wide, subglabrous to distinctly and even rather copiously pubescent especially along the nerves, firmly membranaceous, green above, usually much paler beneath; petiole about 1 cm. long, cuneately winged toward the summit; corymb terminal, fastigiate, convex, often compound; heads sessile or mostly short-pedicelled, 7–9 mm. long; phyllaries lance-linear, gradually narrowed to an acute point, mostly pale green and toward the tip purple-tinged, slightly firmer in texture than in most of the related species, incurved-puberulent and sprinkled with sessile glands; corollas rich purple, the throat and tube usually hirtellous and often glandular-puberulent; achenes (in the typical variety) homomorphous, all crowned by erose scales (about 0.5 mm. long) and awnless.—Nov. Gen. et Spec. iv. 144 (1820). *S. coronifera* DC. Prod. v. 115 (1836). *S. clinopodia* DC. l. c. 116 (1836). *S. jorullensis* var. β. *Humboldtiana* Sch.-Bip. Linnaea, xxv. 276 (1853).

MEXICO: San Luis Potosi: *Parry & Palmer*, no. 320 (Gr.); in the mountains of San Miguelito, *Schaffner*, no. 250 (Gr.). Hidalgo: Real del Monte, *Ehrenberg*, no. 198 in part (Gr.); open woods, El Chico near Pachuca, *Purpus*, no. 1479 (Gr.). Puebla: pine forests around Honey Station, alt. 1770 m., *Pringle*, no. 13,085 (Gr., K.); pine forests, Esperanza, *Purpus*, no. 2788 (Gr.). Frequent in the Federal District, State of Mexico, and Oaxaca. Chiapas: in pine forests of the cooler region, *Ghiesbreght*, nos. 110 in part (Gr.) and 550 (Gr.).

Var. **Ehrenbergiana** (Schlecht.) Sch.-Bip. Differing from the typical variety in having the leaves somewhat more incisely serrate and the achenes heteromorphous, 1–2 of them being merely coronulate with short scale-pappus and the others bearing also 2–3 awns each.—Linnaea, xxv. 276 (1853). *S. Ehrenbergiana* Schlecht. Linnaea, xvi. 370 (1842).

MEXICO: Hidalgo: Real del Monte, *Ehrenberg*, no. 476 (type, hb. Halle, phot. Gr.).

63. **S. amblyolepis** Robinson. (See p. 6.) Erect fibrous-rooted herbaceous perennial, 6–9 dm. high; stem terete, green or purple-tinged, puberulent to obscurely tomentellous when young, leafy to summit; leaves opposite, petiolate, large for the genus, elongate-ovate acute to caudate-acuminate, bluntly serrate, thin-membranaceous,

green on both surfaces, scarcely paler beneath, finely appressed-puberulous above, crisped-pubescent on nerves and veins beneath, 10–14 cm. long, 5–6 cm. wide; petiole 1.5–3 cm. long, cuneately winged from the summit to the base; corymb convex, compound, leafy-bracted; heads short-pedicelled, 9–10 mm. long; phyllaries linear-oblong, obtuse to rounded at tip, thin, green, obscurely subappressed- or incurved-puberulous with delicate white glandless hairs and sprinkled with a few lucid sessile glands; corollas white; achenes about 3.6 mm. long (in the typical form) all coronulate and exaristate, the pappus-scales in 4 achenes about 0.4 mm. long and almost continuously connate into a dentate cup, the fifth achene (idiocarp) slightly precocious and crowned with shorter, narrower and less connate scales.—*S. monardaefolia* var. *amblyolepis* Robinson, Proc. Am. Acad. xxxv. 326 (1900).

Var. α. **typica**. Leaves gradually narrowed to the tip almost from a subtruncately contracted base; teeth mostly rounded; achenes all awnless; adelphocarps bearing a subcontinuous cuplike pappus; idiocarp crowned by a series of short narrow mostly distinct scales.

MEXICO: CHIHUAHUA: Parral, *Goldman*, no. 116 (TYPE, Gr.); hill at the same locality, *Pringle*, no. 13,652 (Gr.).

Var. **umbratilis** Robinson. Leaves less attenuate, more sharply serrate; achenes more strongly heteromorphous, 1–2 (at least in many of the heads) each 1–2-aristate.—Contrib. Gray Herb. xc. 6 (1930).

MEXICO: CHIHUAHUA: *Pringle*, no. 743 (TYPE, Gr., BM., Par., Brl.).

64. **S. elongata** HBK. Erect herbaceous perennial, mostly 6–9 dm. high, sometimes distinctly stoloniferous at base; stem purple, most often densely and shortly glandular-puberulent, sometimes bearing more or less crisped or villous glandless pubescence, or rarely subglabrous up to the inflorescence; leaves opposite (the uppermost sessile or nearly so, the middle and lower borne on often rather prolonged cuneately winged petioles), serrate or crenate except on the petiolar base, acuminate to obtuse or even rounded at tip, membranaceous, inconspicuously pubescent chiefly along the nerves and veins, green on both surfaces, scarcely paler beneath, 3-nerved from a point well above the contracted basal portion, mostly 3–7 cm. long and 2–5(–6) cm. wide; floral leaves much reduced, lanceolate or more often elliptic; heads 9–11 mm. long, sessile or nearly so in dense corymbously or somewhat paniculately disposed glomerules; phyllaries oblong or lanceolate, rather rapidly narrowed to a sharp tip, green or purplish-tinged, closely beset with short spreading at length

stiffish gland-tipped hairs; corollas pale rose or lilac, rarely white, hispidulous.—Nov. Gen. et Spec. iv. 144 (1820).

Founded on a fragmentary specimen, said to have come from near Bogotá, *S. elongata* has hitherto remained rather obscure. This has happened probably because several somewhat misleading expressions occurred in the original diagnosis. For instance the leaves were described as sessile. This is quite true of the uppermost, which happen to be the only ones shown in the scanty type-material, but when seen in nature or shown by fairly complete specimens the plant will be found to have the middle and lower leaves borne on petioles often of considerable length. The branches were said to be alternate and elongate, but even the fragmentary type shows them also opposite and by no means conspicuously lengthened. Finally the type chanced to represent the relatively rare exaristate pappus-variety of the species and was therefore thought separable on account of its coroniform pappus from several closely related plants subsequently discovered and described from Venezuela and from Mexico. However, it is now certain that the presence or absence of awns does not constitute in *Stevia* a specific character in plants otherwise undifferentiated. When judged on the basis of other traits *S. elongata* appears to be the oldest name for a somewhat variable yet pretty readily recognizable plant-entity of rather wide range. The two well marked pappus-varieties are easily distinguished, but though somewhat variable in several other respects the species does not lend itself to further subdivision.

Var. α. **typica**. Achenes uniform or nearly so, crowned by a short scarious rim or cup formed of more or less completely connate somewhat toothed or erose scales, awnless.—*S. elongata* HBK. l. c. *S. hirtiflora* as interpreted by Sch.-Bip., Klatt, and others in identifying Liebmann's no. 133, certainly not of Sch.-Bip. Linnaea, xxv. 274 (1853). *S. glandulifera* Volkens in Loesener, Bull. Herb. Boiss. ser. 2, vi. 848 (1906), not Schlecht. *S. monardaefolia* var. *repens* Robinson, Contrib. Gray Herb. lxxx. 9 (1928).

MEXICO: San Luis Potosi: on route from San Luis Potosi to Tampico, *Parry & Palmer*, no. 330½ (Gr.). Vera Cruz: Mirador, *Liebmann*, no. 133 (Par., sk. Gr.). Oaxaca: Cuauhtlilla, *Seler*, no. 1516 (Gr. and Brl., where mixed with var. *caracasana*), a form with unusually smooth stem. Jalisco: Real Alto, Arroyo de las Cruzes, alt. 2500 m., *Mrs. Mexia*, no. 1610 (Gr.).

[Colombia.]

Var. β. **caracasana** (DC.), comb. nov. Achenes heteromorphous, 3–4 of them bearing both a scale-pappus and 2–3 awns each, the others merely coronulate with a pappus of more or less connate erose scales.—*S. caracasana* DC. Prod. v. 119 (1836); Sch.-Bip. Linnaea, xxv. 282 (1853). *S. elliptica* Hook. & Arn. Bot. Beech. 434 (1841).

MEXICO: Durango: alt. 800 m., Sianori, *Ortega*, no. 5272 (Gr.). Sinaloa: San Blas, *Sinclair* (K., phot. Gr.). Jalisco: rocky hills near Guadalajara, *Pringle*, no. 2129 (Gr.); wooded stream-banks at cañon-bottom (where becoming 1.5–2 m. high and slightly lignescent), alt. 1425 m., San Sebastian, *Mrs. Mexia*, no. 1392 (Gr.). Colima: *Palmer* ('91) 1219 (Gr., U. S.). Michoacan: Quinicó near Morelia, *Arsène* (Gr.). Michoacan or Guerrero: in clayey soil, alt. 1700 m., in the Sierra Madre, *Langlassé*, no. 775 (Gr., U. S.). Morelos: Cuernavaca, *Deam*, no. 5 (Gr.), *Pringle*, no. 13,974 (Gr.). State of Mexico: on sunny slopes, Tultepec, *Seler*, no. 4448 (Gr.). Puebla: rocky slopes, San Luis, *Purpus*, no. 2546 (Gr.). Vera Cruz: Orizaba, *Botteri*, no. 605 (Gr.), *Bourgeau*, nos. 3348 (Gr.) and 3349 (Par., and in part K.); on savannahs, Zacuapan, *Purpus*, nos. 2857 (Gr.) and 6319 (Gr.).

GUATEMALA: dry open cañon near Guatemala, *Holway*, no. 629A (Gr.).

HONDURAS: Cerro Picacho, alt. about 1540 m., Tegucigalpa, *Niederlein* (Brl.).

EL SALVADOR: Dept. Santa Ana: open hillside near Santa Ana, alt. 655-800 m., *Standley*, no. 19,683 (Gr.). Dept. San Salvador: in forest near summit of Cerro de San Jacinto, alt. 800–1171 m., *Standley*, no. 20,631 (Gr.).

COSTA RICA: Heredia, alt. 1200 m., *Holway*, no. 268 (Gr.), pastures on banks of the Rio Virilla near San Juan, alt. 1100 m., *Tonduz*, no. 17,931 (Brl.).

[Venezuela.]

65. **S. Purpusii** Robinson. Upright herbaceous perennial, 5–7 dm. or more in height, ascendingly branched from below the middle; stem brown or purplish, puberulent or subtomentellous; leaves opposite, petiolate, ovate, obtuse, serrate except toward the at first abruptly contracted then gradually cuneate base, membranaceous, 2.5–4 cm. long, 1.5–2.5 cm. wide, strongly discolorous, green and closely incurved-puberulent above, much paler and grayish-tomentellous beneath; heads 8–10 mm. long, sessile or nearly so in a compact convex terminal corymb and in lesser corymbs terminating the usually numerous branches; phyllaries lance-oblong, acute, green or slightly purple-tinged, closely covered with minute very shortly stiped glands; corollas roseate, sprinkled on tube and throat with a few sessile glands; the lobes of the limb narrowly ovate or ovate-oblong, 1.5–1.8 mm. long; achenes homomorphous exaristate, slender, dark, slightly scabrid on the somewhat lighter-colored angles, crowned by a scarious cup of almost continuously connate erose scales 0.4–0.5 mm. in height.—Contrib. Gray Herb. xc. 18 (1930).

MEXICO: Morelos: mountains, alt. 2440 m., above Cuernavaca, *Pringle*, no. 11,294 (type, Gr., isotype, U. S.). State of Mexico (?): dry slopes, Salto de Agua, *Purpus*, no. 1486 (Gr., U. S., BM.).

66. **S. monardaefolia** HBK. Upright herbaceous perennial, 6–12 dm. high; stem terete, green or more often purple, evenly leafy to the summit, finely glandular-puberulent above, sometimes crisped-puberulent or -tomentellous or even more coarsely spreading-villous on the older portions; leaves (large for the genus) opposite, long-petioled,

ovate, acuminate, coarsely and bluntly or at times incisely serrate, 6–12 cm. long, 3–7 cm. wide, membranaceous, green and puberulous to pubescent on both surfaces but somewhat paler beneath; petioles (i. e. contracted petiolar portion of blade) cuneiform, 2–4 cm. long; heads about 11 mm. long, sessile or nearly so in dense corymbously disposed glomerules; tegules lance-oblong, rather abruptly narrowed to a mostly acute point, closely beset with spreading gland-tipped hairs or very shortly stiped glands; corollas white or pink to lilac; achenes uniform, slender, 3.2 mm. long, awnless but surmounted by a rim, crown, or shallow cup of more or less continuously connate scales scarcely 0.3 mm. in height.—Nov. Gen. et Spec. iv. 147 (1820). *S. trachelioides* DC. Prod. v. 115 (1836). *S. monardaefolia* var. *macrophylla* Robinson, Proc. Am. Acad. xxxv. 326 (1900), a form with exceptionally long and narrow leaves.

MEXICO: San Luis Potosi: in sandy places Santa Maria del Rio, *Schaffner*, no. 240b (Gr.). Hidalgo: along brooks in mountains, El Chico near Pachuca, *Purpus*, no. 1471A (Gr.). Michoacan: Morelia: *Humboldt & Bonpland* (Par., phot. Gr.); north slope of Mt. Patamban, alt. 2750–3200 m., *E. W. Nelson*, no. 6581 (Gr.), north slope of Mt. Tancitaro, at similar altitudes, *E. W. Nelson*, no. 6891 (Gr.). Michoacan or Guerrero: crest of the Sierra Madre, alt. 2200 m., *Langlassé*, no. 874 (Gr., U. S.). State of Mexico and Federal District: many collections. Morelos: mountains above Cuernavaca, alt. 2000 m., *Pringle*, no. 13,977 (Gr.). Puebla: Boca del Monte, *Purpus*, no. 2641 (Gr., BM.). Vera Cruz: Orizaba, alt. 3050 m., *Liebmann*, nos. 136 (Copenh., Gr.) and 138 (Gr.).

67. **S. microchaeta** Sch.-Bip. Erect, stout, slightly viscid, suffruticose; leaves opposite, petiolate, oblong or lanceolate, acuminate both ways, finely crenate-serrate except toward the base, feather-veined, 10–16 cm. long, 5–6 cm. wide, membranaceous, sparingly pubescent above, somewhat villous-pubescent or even flocculent-woolly along the midnerve beneath; petiole 2–3 cm. long; floral leaves (apparently the only ones seen by Schultz when drawing the original diagnosis) much smaller, lanceolate, subsessile, nearly entire; corymb large, compound, flattish, 3 dm. or more in diameter, fastigiate: heads 12–13 mm. long, slender, mostly pedicelled; phyllaries linear, acuminate, minutely subappressed-puberulent, 7.5 mm. long; corollas apparently white or nearly so; achenes alike, slender, crowned with about 3 short bristle-like awnlets (scarcely 0.4 mm. in length) and several much shorter intermediate awnlets or vestiges (often to be detected only with the compound microscope).—Linnaea, xxv. 291 (1853).

MEXICO: Oaxaca: *Franco*, no. 274. Vera Cruz: Orizaba, *Botteri*, no. 407 (Gr.); Pelado, *Liebmann*, no. 120 (Copenh., sk. and fragm. Gr.).

An apparently rare and local species, with large feather-veined

leaves, an ample (*Verbesina*-like) flattish corymb, and peculiar pappus of minute awnlets.

North American Stevias referred to Synonymy or still doubtful.

S. adenophora Lag. Gen. et Spec. Nov. 27 (1816) = ? S. ELATIOR HBK.

S. amabilis Lemmon ex Gray, Proc. Am. Acad. xix. 1 (1883) = S. VISCIDA HBK.

S. angustifolia HBK. Nov. Gen. et Spec. iv. 149 (1820) = S. SALICIFOLIA var. EXARISTATA Sch.-Bip.

S. arachnoidea Robinson, Proc. Am. Acad. xxxv. 326 (1900) = S. POLYCEPHALA Bertoloni.

S. Benthamiana Hieron. in Engl. Bot. Jahrb. xxviii. 561 (1901) = S. RHOMBIFOLIA HBK.

S. bicrenata Klatt in Engl. Bot. Jahrb. viii. 32 (1886) = S. ELATIOR HBK.

S. canescens HBK. Nov. Gen. et Spec. iv. 143 (1820) = S. SERRATA var. IVAEFOLIA (Willd.) Robinson.

S. caracasana DC. Prod. v. 119 (1836) = S. ELONGATA var. CARACASANA (DC.) Robinson.

S. Claussenii var. *boliviensis* Volkens, Bull. Herb. Boiss. ser. 2, vi. 848 (155), not Hieron. = S. ASCHENBORNIANA Sch.-Bip.

S. clinopodia DC. Prov. v. 116 (1836) = S. JORULLENSIS HBK.

S. collodes Greenman, Proc. Am. Acad. xxxix. 93 (1903) = S. SALICIFOLIA var. COLLODES (Greenman) Robinson.

S. compacta Benth. Pl. Hartw. 197 (1845) = S. RHOMBIFOLIA var. STEPHANOCOMA Sch.-Bip.

S. conferta, formae *capitata*, *corymbosa* and *ramosa* Schlecht. Hort. Hal. 16 (1841) = S. PILOSA Lag.

S. conferta α. *pilosa* (Lag.) DC. Prod. v. 116 (1836) = S. PILOSA Lag.

S. conferta β. *puberula* DC. Prod. v. 116 (1836) = S. PILOSA var. PUBERULA (DC.) Robinson.

S. coronifera DC. Prod. v. 115 (1836) = S. JORULLENSIS HBK.

S. decumbens (Robinson & Greenman) Greene, Pittonia, iii. 32 (1896) = S. LIEBMANNII Sch.-Bip.

S. diffusa Greenman, Proc. Am. Acad. xxxii. 307 (1897) = S. ASCHENBORNIANA Sch.-Bip.

S. dissoluta Schlecht. Hort. Hal. 16 (1841) = S. ELATIOR var. DISSOLUTA (Schlecht.) Robinson.

S. DIVARICATA DC. Prod. v. 123 (1836). One of the multiaristate

species doubtfully attributed to Mexico by DeCandolle but as yet neither verified by later Mexican collection nor precisely matched by South American material. The type-sheet in the Prodromus collection at the Botanical Conservatory in Geneva shows only the upper portion of a single loosely branched flowering stem. The leaves are lanceolate. However, they are not entire (as stated by DeCandolle) but finely about 2-toothed somewhat above the middle on each side. The inflorescence is minutely glandular-puberulent. Further down the stem is covered with a slight glandless puberulence. The heads (about 12 mm. long) are rather densely glomerulate at the tips of spreading-ascending branches; the phyllaries are oblong, acute, and dorsally glandular-puberulent. The achenes are clearly heteromorphous, the four adelphocarps bearing 11–15 awns each and having the body (4.5 mm. long) scabrid both on the surfaces and angles, while the idiocarp (of similar size) is nearly calvous and but slightly roughened on the angles only.

S. Ehrenbergiana Schlecht. Linnaea, xvi. 370 (1842) = S. JORULLENSIS var. EHRENBERGIANA (Schlecht.) Sch.-Bip.

S. elatior var. *coronata* Sch.-Bip. Linnaea, xxv. 271 (1853) = S. WAGENERI Hieron.

S. elatior var. ? *decumbens* Robinson & Greenman, Am. Jour. Sci. ser. 3, 1. 152 (1895) = S. LIEBMANNII Sch.-Bip.

S. elliptica H. & A. Bot. Beech. 434 (1841) = S. ELONGATA var. CARACASANA (DC.) Robinson.

S. enarthotricha Lag. Gen. et Spec. Nov. 27 (1816) = ? S. ELATIOR HBK.

S. enarthrotricha Sch.-Bip. (orthographic correction of Lagasca's name of doubtful application) = ? S. ELATIOR HBK.

S. erecta Walp. Rep. ii. 548 (1843) = S. OVATA Willd.

S. fascicularis Less. Linnaea, v. 140 (1830) = S. RHOMBIFOLIA HBK.

S. fastigiata HBK. Nov. Gen. et Spec. 148 (1820) = S. LUCIDA Lag.

S. foliosa Small, Fl. S. E. U. S. 1163, 1338 (1903) = S. SALICIFOLIA var. STENOPHYLLA (Gray) Robinson.

S. glabra Moc. ex DC. Prod. v. 117 (1836) = S. CONNATA Lag.

S. glandulifera Schlecht. Ind. Sem. Hort. Hal. 19 (1839) & Hort. Hal. 15, t. 8 (1841) = S. RHOMBIFOLIA var. GLANDULIFERA (Schlecht.) Robinson.

S. glandulifera Volkens in Loesener, Bull. Herb. Boiss. ser. 2, vi. 848 (1906), not Schlecht. = S. ELONGATA HBK.

S. glutinosa HBK. Nov. Gen. et Spec. iv. 148 (1820) = S. LUCIDA Lag.

S. glutinosa var. *angustifolia* Sch.-Bip. Linnaea, xxv. 289 (1853) = S. LUCIDA Lag.

S. glutinosa var. *oaxacana* DC. Prod. v. 116 (1836) = S. LUCIDA Lag.

S. grandidentata Sch.-Bip. ex Klatt, Leopoldina, xx. 75 (1884), not Sch.-Bip. Bull. Soc. Bot. Fr. xii. 81 (1865) = S. LUCIDA var. BIPONTINI Robinson.

S. HAENKEANA DC. Prod. v. 122 (1836). Said by DeCandolle to have been collected in Mexico by Haenke, but belonging to the multiaristate group thus far known only from South America. The type, consisting of the upper part of a single flowering stem, shows a plant with the habit of the Brazilian *S. veronicae* DC. except for the fact that the heads are very shortly pedicelled and rather closely glomerulate in a 3–5-branched corymb. The achenes are distinctly heteromorphous, the 4 adelphocarps being each about 12-aristate and having both angles and surfaces scabrid, while the idiocarp is calvous and roughened only upon the angles. The heads are about 1 cm. long and the phyllaries oblong-lanceolate and 5 mm. in length. The leaves are elliptic, crenate and firmly membranaceous. The species has as yet been neither verified in Mexico nor exactly matched by South American material.

S. hirtiflora of authors, not however as originally applied by Sch.-Bip. = S. ELONGATA HBK.

S. HISPIDULA DC. Prod. v. 122 (1836). Another of the multiaristate Stevias thought to have been collected by Neé in Mexico, but thus far neither verified as a Mexican plant nor satisfactorily matched with South American material. Described by DeCandolle as follows: "caule herbaceo erecto apice tenuissime glanduloso-velutino, foliis oppositis oblongo-lanceolatis utrinque attenuatis apice serratis margine et subtus in nervo sparse setoso-hispidis, corymbo terminali conferto, capitulis pedicellatis, invol. squamis lanceolatis acuminatis dorso puberulis achaenio parcè longioribus, pappi setis 20–25 scabris corollae intus ad faucem et extus subvillosae subaequalibus 2ℓ in Mexico verisim. legit Neé, saltem ex ejus herb. habui commixtam cum St. vigintisetâ. (v. s.)." There is a photograph and tracing of the type at the Gray Herbarium.

S. hymenoppa Moc. ex DC. Prod. v. 117 (1836) = S. LUCIDA Lag.

S. hyssopifolia Cav. Desc. 190 (1802) = S. EUPATORIA (Spreng.) Willd.

S. hyssopifolia HBK. Nov. Gen. et Spec. iv. 140 (1820) = S. VISCIDA HBK.

S. hyssopifolia Sims. Bot. Mag. t. 1861 (1817) = S. OVATA Willd.

S. INCANESCENS Lag. Gen. et Spec. Nov. 27 (1816). Described merely with the words "foliis crenato-serratis subtus tomentoso-incanis," this is indeterminate. It is said to have come from Mexico, whence introduced to Spanish gardens by seed sent by Sesse. Lagasca recognized three varieties, as follows: α. pappo paleaceo-aristatoque, aristis quattuor. β. pappo paleaceo uniaristatoque. γ. pappo paleaceo, mutico. Without the slightest data as to the leaf-contour, inflorescence, phyllaries or florets, any attempt to place this species would be mere guesswork.

S. integra Blake, Contrib. U. S. Nat. Herb. xxii. 589 (1924) = S. SALICIFOLIA var. INTEGRA (Blake) Robinson.

S. ivaefolia Willd. Gesellsch. Naturf. Fr. Berlin, Mag. i. 137 (1807) = S. SERRATA var. IVAEFOLIA (Willd.) Robinson.

S. jorullensis var. *Humboldtiana* Sch.-Bip. Linnaea, xxv. 276 (1853) = S. JORULLENSIS HBK. (typical).

S. lanceolata Lag. Gen. et Spec. Nov. 26 (1816) = S. SERRATA var. IVAEFOLIA (Willd.) Robinson.

S. lanceolata Moc. ex DC. Prod. v. 116 (1836) = S. SUBPUBESCENS Lag.

S. lanceolata Walp. Linnaea, xiv. 319 (1840), neither Lag., nor Moc., nor H. & A. = S. KARWINSKYANA Steud.

S. laxa Robinson & Seaton, Proc. Am. Acad. xxviii. 107 (1893) = in part S. MICRADENIA Robinson and in part S. ORIZABENSIS Robinson.

S. leucantha Schlecht. Hort. Hal. 16 (1841) = S. NEPETAEFOLIA var. LEUCANTHA (Schlecht.) Sch.-Bip.

S. leuconeura DC. Prod. v. 121 (1836) = S. VISCIDA HBK.

S. linoides Sch.-Bip. Linnaea, xxv. 284 (1853) = S. SERRATA var. LINOIDES (Sch.-Bip.) Robinson.

S. longifolia Moc. ex DC. Prod. v. 118 (1836) = S. CONNATA Lag.

S. Lozanoi Robinson, Proc. Am. Acad. xliii. 28 (1907) = S. VISCIDA HBK.

S. lucida var. *opaca* Sch.-Bip. in Seem. Bot. Herald. 299 (1856) = S. SUBPUBESCENS var. OPACA (Sch.-Bip.) Robinson.

S. macella Gray, Pl. Wright. ii. 70 (1853) = S. MICRANTHA Lag.

S. madrensis Gray, Proc. Am. Acad. xxi. 382 (1886) = S. PLUMMERAE Gray.

S. microcephala DC. Prod. v. 118 (1836) = in part S. SERRATA var. IVAEFOLIA (Willd.) Robinson and in part probably S. RHOMBIFOLIA HBK.

S. microphylla HBK. Nov. Gen. et Spec. iv. 140 (1820) = S. TRIFIDA Lag.

S. mollis Schrad. ex DC. Prod. v. 120 (1836) = S. NEPETAEFOLIA HBK.

S. monardaefolia var. *cordifolia* Gray, Proc. Am. Acad. xxi. 431 (1886) = S. BERLANDIERI var. ANADENOTRICHA Robinson.

S. monardaefolia var. *macrophylla* Robinson, Proc. Am. Acad. xxxv. 326 (1900), not satisfactorily distinguishable from the typical form.

S. monardaefolia var. *repens* Robinson, Contrib. Gray Herb. lxxx. 9 (1928) = S. ELONGATA HBK.

S. multifida DC. Prod. v. 121 (1836) = S. TRIFIDA Lag.

S. nepetifolia Willd. ex Sch.-Bip. Linnaea, xxv. 280 (1853) = S. NEPETAEFOLIA HBK.

S. nitida Walp. Linnaea, xiv. 320 (1840) = S. LUCIDA Lag.

S. paniculata Lag. Gen. et Spec. Nov. 27 (1816) = S. OVATA Willd.

S. podocephala DC. Prod. v. 121 (1836) = S. ELATIOR HBK.

S. podocephala Schauer, Linnaea, xix. 718 (1847), not DC. = S. ASCHENBORNIANA Sch.-Bip.

S. punctata (Jacq.) Sch.-Bip. Linnaea, xxv. 286 (1853) = S. SERRATA Cav.

S. punctata (Ort.) Pers. Syn. 403 (1807) = S. SERRATA Cav.

S. purpurea (*quinquearistata*) Lag. "*Elench. H. R. M. anno* 1805" ex Lag. Gen. et Spec. Nov. 26 (1816), not Pers. = S. VISCIDA HBK.

S. purpurea β. dianthoides Sch.-Bip. Linnaea, xxv. 285 (1853) = S. PILOSA Lag.

S. quitensis HBK. Nov. Gen. et Spec. iv. 145 (1820) = S. RHOMBIFOLIA HBK.

S. rhombifolia Willd. ex Sch.-Bip. Linnaea, xxv. 270 (1853), not HBK. = S ELATIOR HBK.

S. sessilifolia Willd. ex Sch.-Bip. Linnaea, xxv. 270 (1853) = S. ELATIOR HBK.

S. semperflorens Ten. ex DC. Prod. v. 117 (1836) = S. SALICIFOLIA Cav.

S. serrata var. *ovalis* Robinson, Proc. Am. Acad. xxix. 317 (1894) = S. OVALIS Robinson.

S. stenophylla Gray, Proc. Am. Acad. xv. 25 (1879) = S. SALICIFOLIA var. STENOPHYLLA (Gray) Robinson.

S. stricta Hornem. Hort. Hafn. ii. 792 (1815) = ? S. EUPATORIA (Spreng.) Willd.

S. subpubescens Benth. Pl. Hartw. 19 (1839), not Lag. = S. DICTYOPHYLLA Robinson.

S. tenella Moc. ex DC. Prod. v. 121 (1836) = S. MICRANTHA Lag.

S. tephra Robinson, Proc. Am. Acad. xxxv. 328 (1900), as to plant described = S. SERRATA var. IVAEFOLIA (Willd.) Robinson, but as to

Pringle's no. 8229 in part (mistakenly distributed as isotype material) = S. RHOMBIFOLIA var. GLANDULIFERA (Schlecht.) Robinson.

S. ternifolia HBK. Nov. Gen. et Spec. iv. 146 (1820) = S. RHOMBIFOLIA HBK. (mere ternate-leaved form).

S. tomentosa Schauer, Linnaea, xix. 718 (1847), not HBK. = S. NEPETAEFOLIA HBK.

S. trachelioides DC. Prod. v. 115 (1836) = S. MONARDAEFOLIA HBK.

S. trichopoda Harv. & Gray, Pl. Fendl. (Mem. Am. Acad. n. ser. iv.) 64 (1849) = S. ELATIOR HBK.

S. triflora DC. Prod. v. 115 (1836) = S. RHOMBIFOLIA HBK.

S. umbellata Alam. "in litt. 1831" acc. to DC. Prod. v. 118 (1836) = S. CONNATA Lag.

S. uniaristata DC. Prod. v. 120 (1836) = S. RHOMBIFOLIA var. UNIARISTATA (DC.) Sch.-Bip.

S. VIGINTISETA DC. Prod. v. 123 (1836). This smoothish erect plant, which DeCandolle supposed to have been collected by Karvinski in Mexico, is represented solely by some fragments in a pocket on the type-sheet in the Prodromus herbarium at the Botanical Conservatory of Geneva. On the same sheet DeCandolle had mounted a specimen (without data) which possesses some similarity of habit but which shows a permanently pubescent stem, more definitely crenate and less clearly 3-nerved leaves, and smaller bracts. This latter element is clearly distinct from the Karvinski material and seems probably identical with the Brazilian *S. Veronicae* DC. The Karvinski element, represented only by the fragments in the pocket, has the stem covered with very minute scarcely glandular pubescence. Its upper 2–3 leaves are alternate (as stated by DeCandolle) but the lowest of which traces are shown were opposite. The sole leaf shown in fair maturity is lanceolate, subentire, acute at both ends and 3-nerved, about 5 cm. long and 12 mm. wide, the upper surface obsoletely punctate, deep green and appressed white-puberulent, the lower slightly paler, with rather dense spreading yellowish pubescence on the midrib and nerves and lucid globular glands on the surface. The inflorescence is corymbose, the bracts lanceolate, the bractlets 3.5 mm. long, the phyllaries oblong, obtusish, minutely glandular-puberulent, 7 mm. long; the corollas appear to be glabrous and have lobes about 2 mm. long. The achenes appear to be homomorphous, each bearing about 20 purple-tinged awns nearly equalling the corolla. No such plant has been subsequently verified from Mexico. While manifestly suggesting South American affinities it cannot as yet be definitely identified with any South American species.

S. vimínea Schrad, Hort. Goett. 1832; DC. Prod. v. 117 (1836) = S. CONNATA Lag.

S. virgata HBK. Nov. Gen. et Spec. iv. 142 (1820) = S. SERRATA Cav.

S. viscosa Hort. ex Steud. Nom. ed. 2, ii. 642 (1841) = probably S. VISCIDA HBK.

NUMBERED EXSICCATAE OF THE STEVIAS OF THE UNITED STATES, MEXICO AND CENTRAL AMERICA VERIFIED DURING THE FOREGOING REVISION

Andrieux

285 lucida Lag.

Arsène

495a micrantha Lag.
1789 subpubescens Lag.
8810 elatior HBK.
8860 salicifolia Cav.
10,509 rhombifolia HBK.
10,615 serrata v. ivaefolia (Willd.) Robinson

Aschenborn

652 Aschenborniana Sch.-Bip.

Barclay

1194 glandulosa H. & A.

Berlandier

636 elatior HBK.
663 pilosa v. puberula (DC.) Robinson
696 serrata v. linoides (Sch.-Bip.) Robinson
748 viscida HBK.
853 rhombifolia HBK.
877 micrantha Lag.
1060 (in part) rhombifolia HBK.
1060 (in part) salicifolia Cav.
1107 rhombifolia v. stephanocoma Sch.-Bip.
1164 monardaefolia HBK.
2273 rhombifolia HBK.
3160 Berlandieri Gray

Bernoulli

285 elatior HBK.

Bilimek

498 viscida HBK.
502 serrata Cav.
503 micrantha Lag.
505 micrantha Lag.

Blumer

128 micrantha Lag.
1344 Plummerae Gray
1478 serrata Cav.
3319 serrata Cav.
3320 Plummerae Gray

Botteri

407 microchaeta Sch.-Bip.
605 elongata v. caracasana (DC.) Robinson
824 rhombifolia HBK.
1125 orizabensis Robinson

Bourgeau

77 bis rhombifolia HBK.
171 salicifolia Cav.
368 serrata v. arguta Robinson
379 salicifolia Cav.
391 elatior HBK.
605 pilosa Lag.
709 viscida HBK.
710 rhombifolia HBK.
712 monardaefolia HBK.
815 bis rhombifolia HBK.
817 pilosa Lag.
819 ovata Willd.?
820 monardaefolia HBK.
821 viscida HBK.
823 jorullensis HBK.
1066 subpubescens Lag.
1069 micrantha Lag.
1072 monardaefolia HBK.
1223 jorullensis HBK.
2845 rhombifolia HBK.
3086 serrata Cav.
3243 connata Lag.
3331 orizabensis Robinson
3348 elongata v. caracasana (DC.) Robinson

Conzatti

716 connata Lag.
1862 lucida Lag.

3830 rhombifolia HBK.
3977 lucida Lag.

Conzatti & Gonzáles

46 connata Lag.
47 rhombifolia HBK.
48 hirsuta DC.
386 viscida HBK.
1017 hirsuta DC.
1018 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
1019 Seemannii Sch.-Bip.
1020 hirsuta DC.
1022 lucida Lag.

Coulter

265 micrantha Lag.
267 elatior HBK.
272 jorullensis HBK.
279 eupatoria (Spreng.) Willd.
280 pilosa Lag.
282 viscida HBK. Awnless form

Deam

5 elongata v. caracasana (DC.) Robinson
26 subpubescens Lag.
134 subpubescens Lag.

Diguet

28 viscida HBK.
158 subpubescens Lag.

Dugès

274 lucida Lag.
474 tomentosa HBK.
475 salicifolia v. exaristata Sch.-Bip.

Eggleston

10,859 serrata Cav.
10,998 micrantha Lag.

Ehrenberg

30 hirtiflora Sch.-Bip.
198 (in part) jorullensis HBK.
198 (in part) rhombifolia HBK.
199 (in part) rhombifolia HBK.
199 (in part) rhombifolia HBK. v. stephanocoma Sch.-Bip.
476 jorullensis v. Ehrenbergiana (Schlecht.) Robinson
477 (in part) rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
477 (in part) jorullensis HBK.
479 elatior HBK.
479c elatior HBK.
482 micrantha Lag.
490 pilosa Lag.
491 pilosa Lag.
492 eupatoria (Spreng.) Willd.
496a viscida HBK.
798 micrantha Lag.
833 salicifolia Cav.
1094 pyrolaefolia Schlecht.

Endlich

401 nepetaefolia HBK.
875 Berlandieri Gray

Ervendberg

55 rhombifolia HBK.

Franco

274 microchaeta Sch.-Bip.

Galeotti

2162 monardaefolia HBK.
2186 subpubescens Lag.
2394 jaliscensis Robinson

Garcia

387 pelophila Blake

Ghiesbreght

78 lucida Lag.
110 (in part) jorullensis HBK.
526 lucida Lag.
531 rhombifolia HBK.
550 jorullensis HBK.
567 serrata Cav.
579 tomentosa HBK.

Goldman

107 serrata Cav.
108 viscida HBK.
112 viscida HBK. An anisocarpic form
116 amblyolepis Robinson
119 [or 169?] venosa Gray
154 serrata Cav.
161 simulans Robinson
169 [or 119?] venosa Gray
342 Lemmoni Gray
351 trifida Lag.
1047 tephrophylla Blake

Gómez

1062 serrata Cav.
1069 rhombifolia HBK.

Goodding

927 micrantha Lag.

Greene

336 serrata v. ivaefolia (Willd.) Robinson

Gregg

224 Berlandieri Gray
373 tomentosa HBK.
405 tomentosa HBK.
588 salicifolia v. exaristata Sch.-Bip.

Hahn

153 serrata Cav.

Harshberger

127 pilosa v. puberula (DC.) Robinson

Hartman

129 salicifolia Cav.
273 glandulosa H. & A.
795 salicifolia Cav.

Hartweg

135 purpurea Pers.
136 serrata Cav.
137 dictyophylla Robinson
141 scabrella Benth.
304 cordifolia Benth.
305 latifolia Benth.
308 reglensis Benth.

Heyde & Lux

3365 elatior HBK.
3374 lucida Lag.
3780 rhombifolia HBK.
3789 elatior HBK.
4252 rhombifolia v. stephanocoma Sch.-Bip.
6168 rhombifolia HBK.

Hoffmann

376 rhombifolia v. stephanocoma Sch.-Bip.

Holway

104 polycephala Bertoloni
268 elongata v. caracasana (DC.) Robinson
629a elongata v. caracasana (DC.) Robinson
772 lucida Lag.
3107 rhombifolia HBK.
3135 salicifolia v. exaristata Sch.-Bip.
3565 rhombifolia HBK.
3581 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
5159 monardaefolia HBK.
5172 serrata Cav.
5181 rhombifolia HBK.

Humboldt & Bonpland

3963 trifida Lag.
4227 serrata v. ivaefolia (Willd.) Robinson
4399 rhombifolia HBK.

Jones

23,371 trifida Lag.

Langlassé

33 trifida Lag.
534 rhombifolia HBK.
546 rhombifolia HBK.
774 subpubescens v. opaca (Sch.-Bip.) Robinson
775 elongata v. caracasana (DC.) Robinson
861 trifida Lag.
874 monardaefolia HBK.
1065 Lehmannii Hieron.

Lehmann

1627 elatior HBK.

Lemmon

131 serrata Cav.
132 viscida HBK.
133 jorullensis HBK.
136 tomentosa HBK.
189 Lemmoni Gray
320 micrantha Lag.
321 micrantha Lag.
618 serrata v. ivaefolia (Willd.) Robinson
2729 viscida HBK.
2730 Plummerae Gray
2731 Plummerae v. alba Gray
2732 serrata v. ivaefolia (Willd.) Robinson
2733 serrata Cav.

Liebmann

120 microchaeta Sch.-Bip.
121 elatior HBK.
122 subpubescens Lag.
123 viscida HBK.
125 Liebmannii Sch.-Bip.

126 lucida Lag.
128 lucida v. Bipontini Robinson
129 rhombifolia HBK.
130 jorullensis HBK.
132 lucida Lag.
133 elongata HBK.
136 monardaefolia HBK.
138 monardaefolia HBK.
8802 elatior HBK.
8805 elongata HBK.
8806 viscida HBK.
8807 Liebmannii Sch.-Bip.
8808 subpubescens Lag.
8815 lucida Lag.

Lloyd

6 salicifolia v. stenophylla (Gray) Robinson
395 salicifolia Cav.

Mairet

118 jorullensis HBK.

Mearns

2254 serrata v. ivaefolia (Willd.) Robinson

Metcalfe

526 serrata v. ivaefolia (Willd.) Robinson
1412 micrantha Lag.
1437 serrata v. ivaefolia (Willd.) Robinson

Mexia

799 serrata Cav.
897 micrantha Lag.
1392 elongata v. caracasana (DC.) Robinson
1476-a glandulosa H. & A.
1501 subpubescens Lag.
1610 elongata HBK.
1615 subpubescens v. opaca (Sch.-Bip.) Robinson

Nelson, E. W.

990 elatior HBK.
1093 rhombifolia v. stephanocoma f. glandulifera (Schlect.) Robinson
1207 elatior HBK.
1308 jorullensis HBK.
1812 lucida Lag.
2133 neurophylla Robinson & Greenman
2207 nepetaefolia HBK.
2244 latifolia Benth.
2680 rhombifolia HBK.
3141 serrata v. ivaefolia (Willd.) Robinson
3418 rhombifolia v. stephanocoma Sch.-Bip.
4486 pilosa v. puberula (DC.) Robinson
4738 purpurea Pers.
4795 Plummerae v. alba Gray
4859 Pringlei Wats.
4860 Plummerae Gray
4997 viscida HBK.
6204 Pringlei Wats.
6254 serrata Cav.
6264 Plummerae Gray
6579 Nelsonii Robinson
6581 monardaefolia HBK.
6890 subpubescens v. opaca (Sch.-Bip.) Robinson
6891 monardaefolia HBK.

Nicolas, Bro.

480 elatior HBK.
10,159 tomentosa v. Seatonii Robinson
10,160 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson

Oersted

8821 rhombifolia v. stephanocoma Sch.-Bip.

Orcutt

3527 elatior HBK.
3652 elatior HBK.
4293 micrantha Lag.
4306 micrantha Lag.

Ortega

5068 trifida Lag.
5272 elongata v. caracasana (DC.) Robinson

Palmer

29 ('96) salicifolia v. virgulifera Robinson
30 ('85) Palmeri Gray
37 ('02) purpurea Pers.
46 ('02) lucida Lag.
95 ('86) trifida Lag.
96 ('06) Lemmoni Gray
102 ('02) elatior HBK.
116 ('02) serrata v. ivaefolia (Willd.) Robinson
153 ('02) rhombifolia HBK.
154 ('02) rhombifolia HBK.

169 ('02) purpurea Pers.
193 ('02) elongata passing to v. caracasana (DC.) Robinson
224 ('86) jaliscensis Robinson
251 ('85) serrata v. linoides (Sch.-Bip.) Robinson
257 ('85) Berlandieri v. anadenotricha Robinson
278 ('85) salicifolia v. stenophylla (Gray) Robinson
284 ('85) micrantha Lag.
287 ('90) trifida Lag.
309 ('86) ovalis Robinson
316 ('86) serrata v. linoides (Sch.-Bip.) Robinson
319 ('86) serrata Cav.
319½ ('78–'79) rhombifolia HBK.
320½ ('78–'79) latifolia Benth.
321½ ('78–'79) rhombifolia HBK.
328 ('85) Plummerae Gray
330½ ('78–'79) elongata HBK.
335 ('08) salicifolia v. stenophylla (Gray) Robinson
338 ('85) serrata Cav.
357 ('86) rhombifolia HBK.
376 ('85) venosa Gray
386 ('90) Lemmoni Gray
391 ('85) salicifolia v. stenophylla (Gray) Robinson
401 ('02) salicifolia v. anathera Robinson
407 ('96) rhombifolia HBK.
409 ('04) serrata v. ivaefolia (Willd.) Robinson
414 ('04) tomentosa HBK.
418 ('85) viscida HBK.
431 ('80) salicifolia v. nana Gray
432 ('80) Berlandieri Gray
433 ('80) purpurea Pers.
433a ('80) purpurea Pers.
439 ('80) ovata Willd. (awnless form)?
456 ('86) viscida HBK.
456 ('96) purpurea Pers.
463 ('06) purpurea Pers.
481 ('06) salicifolia v. virgulifera Robinson
493 ('86) rhombifolia v. uniaristata (DC.) Sch.-Bip.
528 ('06) rhombifolia v. stephanocoma Sch.-Bip.
534 ('86) serrata v. linoides (Sch.-Bip.) Robinson
560 ('96) serrata Cav.
601 ('05) Berlandieri v. podadenia Robinson
635 ('96) viscida HBK.
673 ('86) jaliscensis Robinson
679 ('86) phlebophylla Gray
692 ('86) scabridula Robinson
733 ('98) lucida Lag.
742 ('86) rhombifolia HBK.
746 ('96) micrantha Lag.
749 ('96) rhombifolia HBK.
750 ('96) serrata v. haplopappa Robinson
751 ('96) rhombifolia HBK.
787 ('96) viscida HBK.
790 ('96) viscida HBK.
791 ('96) viscida HBK.
799 ('96) serrata v. linoides (Sch.-Bip.) Robinson
931 ('96) salicifolia v. virgulifera Robinson
943 ('96) rhombifolia HBK.
954 ('96) rhombifolia HBK.
958 ('96) rhombifolia f. colorata Robinson
1158 ('91) trifida Lag.
1219 ('91) elongata v. caracasana (DC.) Robinson
1240 ('91) origanoides HBK.
1821 ('92) glandulosa H. & A.

Parish, W. F.

108 Lemmoni Gray

Parry

10 serrata Cav.
11 salicifolia v. nana Gray
12 purpurea Pers.

Parry & Palmer

319 salicifolia v. stenophylla (Gray) Robinson
320 jorullensis HBK.
321 salicifolia v. exaristata Sch.-Bip.
322 Berlandieri v. podadenia Robinson
323 (in part) purpurea Pers.
323 (in part) viscida HBK.
323½ (in part) purpurea Pers.
323½ (in part) viscida HBK.
324 rhombifolia HBK.
325 (in part) serrata Cav.
325 (in part) serrata v. ivaefolia (Willd.) Robinson
326 salicifolia v. nana Gray
327 lucida Lag.
328 micrantha Lag.
330 elatior HBK.

Pittier

406 elatior HBK.
1469 rhombifolia v. stephanocoma Sch.-Bip.
1661 rhombifolia v. stephanocoma Sch.-Bip.
4521 rhombifolia v. stephanocoma Sch.-Bip.
5297 rhombifolia v. stephanocoma Sch.-Bip.
7174 rhombifolia v. stephanocoma Sch.-Bip.
14,073 lucida Lag.

Pringle

17 Plummerae Gray
102 salicifolia v. nana Gray
602 Palmeri Gray
639 serrata v. ivaefolia (Willd.) Robinson
653 serrata Cav.
677 salicifolia v. stenophylla (Gray) Robinson
677½ salicifolia v. nana Gray
742 micrantha Lag.
743 amblyolepis v. umbratilis Robinson
1258 micrantha Lag.
1259 viscida HBK.
1260 Plummerae Gray
1261 venosa Gray
1301 Pringlei Wats.
1614 viscida HBK.
1615 Plummerae Gray
1616 venosa Gray
1617 Pringlei Wats.
1773 jaliscensis Robinson
1780 rhombifolia HBK.
1832 trifida Lag.
1899 Berlandieri Gray
2129 elongata v. caracasana (DC.) Robinson
2291 phlebophylla Gray
2441 subpubescens v. opaca (Sch.-Bip.) Robinson
2486 serrata v. linoides (Sch.-Bip.) Robinson
2487 serrata Cav.
2809 ovata Willd. (awnless form)?
2814 eupatoria (Spreng.) Willd.
2832 dictyophylla Robinson
2854 tomentosa HBK.
3150 elatior HBK.
3176 purpurea Pers.
3246 eupatoria (Spreng.) Willd.
3282 rhombifolia HBK.
3478 pilosa Lag.
3479 purpurea Pers.
4282 tomentosa HBK.
4491 ovalis Robinson
4543 micradenia Robinson
4558 viscida HBK.
4580 connata Lag.
4581 latifolia Benth.
4696 elatior HBK.
4796 lucida Lag.
4933 rhombifolia HBK.
4949 Seemannii Sch.-Bip.
4973 jorullensis HBK.
4974 Liebmannii Sch.-Bip.
4976 hirsuta DC.
5051 micradenia Robinson
5347 subpubescens v. opaca (Sch.-Bip.) Robinson
5676 rhombifolia HBK.
5677½ rhombifolia v. stephanocoma Sch.-Bip.
5838 jorullensis HBK.
6034 jorullensis HBK.
6193 origanoides HBK.
6530 reglensis Benth.
6581 jorullensis HBK.
6593 monardaefolia HBK.
6594 clinopodioides Greenman
6603 hypomalaca Robinson
6605 jorullensis HBK.
6608 Aschenborniana Sch.-Bip.
6614 rhombifolia HBK.
6619 reglensis Benth.
6621 monardaefolia HBK.
6622 tomentosa HBK.
6624 reglensis Benth.
7036 lucida v. Bipontini Robinson
7271 rhombifolia HBK.
7272 serrata v. ivaefolia (Willd.) Robinson
7273 serrata v. ivaefolia (Willd.) Robinson
7274 pilosa v. puberula (DC.) Robinson
7275 serrata Cav.
7276 rhombifolia HBK.
7277 serrata Cav.
7278 rhombifolia HBK.
7279 nepetaefolia HBK.
7280 serrata v. ivaefolia (Willd.) Robinson
7281 jorullensis HBK.
7282 reglensis Benth.
7283 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
7306 jorullensis HBK.

7320 rhombifolia HBK.
7328 monardaefolia HBK.
7652 serrata v. arguta Robinson
7698 vernicosa Greenman
7713 subpubescens Lag.
7893 viscida HBK.
7894 elatior HBK.
7899 purpurea Pers.
7937 elatior HBK.
7950 connata Lag.
7965 serrata v. ivaefolia (Willd.) Robinson
8057 monardaefolia HBK.
8219 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
8220 eupatoria (Spreng,) Willd.
8221 serrata Cav.
8229 serrata v. ivaefolia (Willd.) Robinson
8229 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
8236 pilosa Lag.
8352 viscida HBK.
8570 salicifolia v. collodes (Greenman) Robinson
8703 (in part) origanoides HBK.
8703 (in part) rhombifolia HBK.
8779 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
8798 serrata v. ivaefolia (Willd.) Robinson
8843 lucida Lag.
9051 rhombifolia HBK.
9069 rhombifolia f. colorata Robinson
9070 monardaefolia HBK.
9100 jorullensis HBK.
9104 nepetaefolia HBK.
9105 salicifolia Cav.
9111 monardaefolia HBK.
9120 Aschenborniana Sch.-Bip.
9133 hirsuta DC.
9176 rhombifolia v. stephanocoma Sch.-Bip.
9298 salicifolia Cav.
9547 pilosa Lag.
9975 Aschenborniana Sch.-Bip.
9976 hypomalaca Robinson
9977 micrantha Lag.
9978 Berlandieri Gray
9979 rhombifolia HBK.
9980 origanoides HBK.
9981 phlebophylla Gray
9982 salicifolia Cav.
9983 subpubescens Lag.
9984 jaliscensis Robinson
9985 tomentosa HBK.
9986 connata Lag.
9987 viscida HBK.
10,092 viscida HBK.
10,106 Plummerae v. durangensis Robinson
10,124 alatipes Robinson
10,144 simulans Robinson
10,349 vernicosa Greenman
10,812 salicifolia v. virgulifera Robinson
11,294 Purpusii Robinson
11,297 rhombifolia HBK.
11,316 serrata v. arguta Robinson
11,573 Berlandieri Gray
11,574 jorullensis HBK.
11,575 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
11,576 jorullensis HBK.
11,577 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
11,578 clinopodioides Greenman
11,579 serrata v. linoides (Sch.-Bip.) Robinson
11,580 monardaefolia HBK.
11,581 rhombifolia HBK.
11,582 origanoides HBK.
11,583 pilosa Lag.
11,584 salicifolia Cav.
11,585 serrata Cav.
11,586 ovalis Robinson
11,587 subpubescens Lag.
11,588 tomentosa HBK.
11,589 viscida HBK.
11,833 rhombifolia HBK.
11,834 serrata Cav.
11,835 rhombifolia HBK.
11,836 viscida HBK. (anisocarpic form)
11,837 rhombifolia HBK.
11,897 origanoides HBK.
13,083 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
13,084 hirsuta DC.
13,085 jorullensis HBK.
13,571 micradenia Robinson
13,572 (from Durango) Plummerae Gray
13,572 (from Querétaro) salicifolia Cav.
13,652 amblyolepis Robinson
13,674 salicifolia Cav.

13,781 pilosa Lag.
13,901 lucida Lag.
13,974 elongata v. caracasana (DC.) Robinson
13,977 monardaefolia HBK.

Purpus

60 rhombifolia HBK.
141 subpubescens Lag.
174 subpubescens v. opaca (Sch.-Bip.) Robinson
185 vernicosa Greenman
209 tephrophylla Blake
1347 salicifolia v. virgulifera Robinson
1348 salicifolia Cav.
1470 flourensioides Blake
1471 monardaefolia HBK.
1471A monardaefolia HBK.
1472 monardaefolia HBK.
1473 monardaefolia HBK.
1474 viscida HBK.
1475 serrata Cav.
1476 serrata v. ivaefolia (Willd.) Robinson
1477 tomentosa HBK.
1478 monardaefolia HBK.
1479 jorullensis HBK.
1480 rhombifolia f. colorata Robinson
1482 jorullensis HBK.
1483 subpubescens Lag.
1484 rhombifolia HBK.
1484A rhombifolia HBK.
1485 rhombifolia HBK.
1486 Purpusii Robinson
1487 rhombifolia HBK.
1867 rhombifolia HBK.
2461A elatior HBK.
2539 revoluta Robinson
2540 lucida v. Bipontini Robinson
2541 salicifolia v. collodes (Greenman) Robinson
2542 elongata v. caracasana (DC.) Robinson
2545 lucida Lag.
2546 lucida Lag.
2550 tomentosa HBK.
2551 salicifolia Cav.
2552 purpurea Pers.
2641 monardaefolia HBK.
2642 (in part) pilosa Lag.
2642 (in part) purpurea Pers.
2786 rhombifolia f. colorata Robinson
2787 (in part) jorullensis HBK.
2787 (in part) rhombifolia HBK.
2788 jorullensis HBK .
2856 Karwinskyana Steud.?
2857 elongata v. caracasana (DC.) Robinson
3034 serrata v. ivaefolia (Willd.) Robinson
3035 tomentosa HBK.
3036 lucida v. pueblensis Robinson
3132 elatior v. podophylla Robinson
3840 elatior v. podophylla Robinson
3841 elatior HBK.
3842 revoluta Robinson
4134 hirsuta DC.
4657 salicifolia v. nana Gray
4721 micrantha Lag.
4722 salicifolia v. integra (Blake) Robinson
4829 serrata v. ivaefolia (Willd.) Robinson
4830 rhombifolia HBK.
5147 purpurea Pers.
5681 viscida HBK.
6319 elongata v. caracasana (DC.) Robinson
6478 eupatoria (Spreng.) Willd.
6479 monardaefolia HBK.
9100 Liebmannii v. chiapensis Robinson
9123 connata Lag.
10,862 rhombifolia HBK.
14,045 rhombifolia HBK.

Reko

4607 dictyophylla Robinson

Rose

2773 serrata v. linoides (Sch.-Bip.) Robinson
2994 Rosei Robinson

Rose & Hay

5383 serrata v. linoides (Sch.-Bip.) Robinson
5715 clinopodioides Greenman
6130 rhombifolia HBK.
7752 serrata v. haplopappa Robinson
10,119 lucida Lag.

Rose & Painter

6495 elatior HBK.
6696 purpurea Pers.
7284 rhombifolia f. colorata Robinson
7285 nepetaefolia HBK.

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ST. LOUIS,

7286 salicifolia Cav.
7287 nepetaefolia HBK.
7298 rhombifolia HBK.
7807 viscida HBK.
7809 serrata v. arguta Robinson
7826 jorullensis HBK.
7920 monardaefolia HBK.
8004 jorullensis HBK.
8008 jorullensis HBK.

Rose, Painter & Rose

8275 salicifolia Cav.
9186 eupatoria (Spreng.) Willd.
9232 pilosa Lag.
9639 salicifolia Cav.
9715 salicifolia Cav.
9734 pilosa v. puberula (DC.) Robinson
10,204 viscida HBK.

Rose & Rose

11,106 subpubescens Lag.

Rose Standley & Russell

13,101 Lemmoni Gray
13,108 trifida Lag.

Rothrock

607 serrata Cav.
732 serrata v. ivaefolia (Willd.) Robinson

Rusby

157 (in part) serrata v. ivaefolia (Willd.) Robinson
157 (in part) Plummerae Gray

Schaffner

91 micrantha Lag.
190 micrantha Lag.
220 viscida HBK.
240 micrantha Lag.
240b monardaefolia HBK.
241 micrantha Lag.
242 ovata Willd.?
243 elatior HBK.
244 ('76) purpurea Pers.
244 ('80) viscida HBK.
245 serrata v. ivaefolia (Willd.) Robinson
246 rhombifolia HBK.
247 Berlandieri v. podadenia Robinson
248 salicifolia v. exaristata Sch.-Bip.
249 lucida Lag.
250 jorullensis HBK.
251 salicifolia v. nana Gray
252 salicifolia v. stenophylla (Gray) Robinson
256 salicifolia Cav.
258 nepetaefolia HBK.
259 tomentosa HBK.
260 reglensis Benth.
261 nepetaefolia HBK.
265 tomentosa HBK.
268 serrata Cav.
272 eupatoria (Spreng.) Willd.
273 viscida HBK.
274 viscida HBK.
296 monardaefolia HBK.
297 rhombifolia v. stephanocoma f. glandulifera (Schlecht.) Robinson
682 micrantha Lag.
686 purpurea Pers.
689 lucida Lag.
770 viscida HBK.
1035 viscida HBK.

Schmitz

41 salicifolia Cav.
70 micrantha Lag.
409 viscida HBK.

Schumann

38 salicifolia Cav.
47 micrantha Lag.

Seaton

100 salicifolia Cav.
275 pilosa Lag.
297 serrata Cav.
341 elatior HBK.
389 lucida v. pueblensis Robinson
487 tomentosa v. Seatonii Robinson

Seemann

1989 trifida Lag.
2028 subpubescens v. opaca (Sch.-Bip.) Robinson
2041 Seemannii Sch.-Bip.

Seler

92 elatior HBK.
839 subpubescens Lag.
1154 rhombifolia HBK.
1163 serrata Cav.
1199 viscida HBK.
1219 micrantha Lag.
1283b rhombifolia HBK.
1302 rhombifolia v. stephanocoma

f. glandulifera (Schlecht.) Robinson
1515 Aschenborniana Sch.-Bip.
1516 elongata HBK.
1527 lucida Lag.
1602 Seemannii v. Selerorum Robinson
1695 Seleriana Robinson
2285 rhombifolia v. stephanocoma Sch.-Bip.
2356 serrata v. ivaefolia (Willd.) Robinson
2974 elatior HBK.
3018 rhombifolia HBK.
3065 rhombifolia HBK.
3531 salicifolia Cav.
4108 micrantha Lag.
4151 tomentosa HBK.
4255 Aschenborniana Sch.-Bip.
4286 mitopoda Robinson
4412 salicifolia Cav.
4417 monardaefolia HBK.
4448 elongata v. caracasana (DC.) Robinson
5265 serrata v. linoides (Sch.-Bip.) Robinson

Shreve

5400 Plummerae Gray

Smith, J. D.

2327 polycephala Bertoloni

Smith, L. C.

62 elatior HBK.
134 elatior HBK.
225 hirsuta DC.
286 rhombifolia HBK.
287 rhombifolia v. stephanocoma Sch.-Bip.
364 lucida Lag.
694 lucida Lag.
867 jorullensis HBK.
880 rhombifolia HBK.
881 rhombifolia v. stephanocoma Sch.-Bip.

Standley

19,683 elongata v. caracasana (DC.) Robinson
20,631 elongata v. caracasana (DC.) Robinson
42,467 rhombifolia v. stephanocoma Sch.-Bip.
43,422 rhombifolia v. stephanocoma Sch.-Bip.
44,034 rhombifolia v. stephanocoma Sch.-Bip.
56,442 rhombifolia v. stephanocoma Sch.-Bip.

Thurber

1008 serrata Cav.

Tonduz

17,931 elongata v. caracasana(DC.) Robinson

Townsend & Barber

249 Pringlei Wats.
258 serrata Cav.
302 serrata v. ivaefolia (Willd.) Robinson
310 Plummerae Gray
311 Plummerae Gray
344 venosa Gray
345 Plummerae Gray
347 viscida HBK.
419 Palmeri Gray

Tuerckheim, H. von

II 2004 rhombifolia v. stephanocoma Sch.-Bip.

Warszewicz

31 lucida Lag.

Wislizenus

158 salicifolia Cav.
179 viscida HBK.

Wright

1130 micrantha Lag.
1131 serrata Cav.

Explanation of Plate I

(The figures of this plate, drawn by the writer with the aid of Dr. Lyman B. Smith, are frankly somewhat diagrammatic in character, being designed to indicate prevailing tendencies rather than to record individual peculiarities. The figures summarize observations made from very numerous dissections.)

Figs. I–XIII show in lateral view the upper part of each of the five achenes in heads illustrating the most frequently recurring types of pappus in *Stevia*.

Figs. I, III, V, VII, VIII and XII are the isocarpic forms.

Figs. II, IV, VI, IX, and XIII show the heterocarpic forms corresponding to types I, III, V, VIII and XII respectively. No heterocarpic form is known for type VII. In Figs. II, IV, VI, IX and XIII the idiocarp is shown at the right in each series. It is distinguished chiefly by the absence of awns or a considerable reduction in their number, likewise by a reduction or even obsolescence of the coroniform pappus, and finally by a greater smoothness of the achene faces.

Figs. I–IX show those types in which the transition from the adelphocarps to the idiocarp is abrupt.

Figs. X and XI show types in which there is gradual transition from the adelphocarps to the idiocarp.

Figs. XII and XIII represent certain chiefly South American types in which the awnlets of types V and VI are replaced by longer and more bristle-like awns occasionally equalling the corolla but mostly a third to two-thirds its length.

Fig. XIV shows on a larger scale a typical awnbearing adelphocarp with its surfaces as well as its angles scabrid.

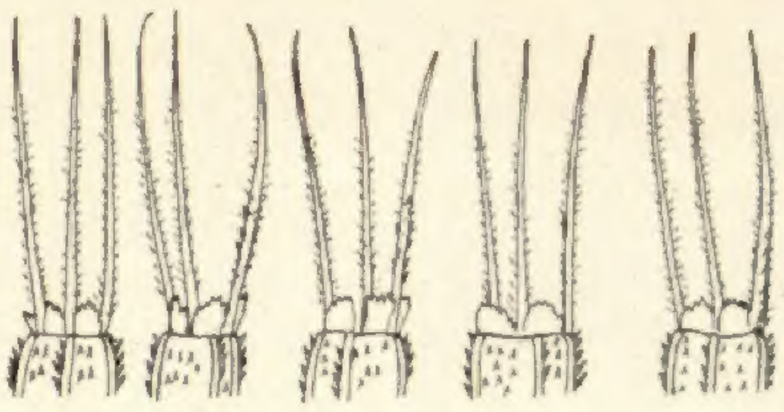
Fig. XV shows a corresponding idiocarp which is awnless, slightly stouter and almost or quite smooth on its surfaces.

Fig. XVI shows a diagrammatic cross-section of the head of a typical heterocarpic *Stevia*. br. bractlet; 1–5 the phyllaries numbered upward, that is centripetally. Note position of the shaded achene which is the idiocarp.

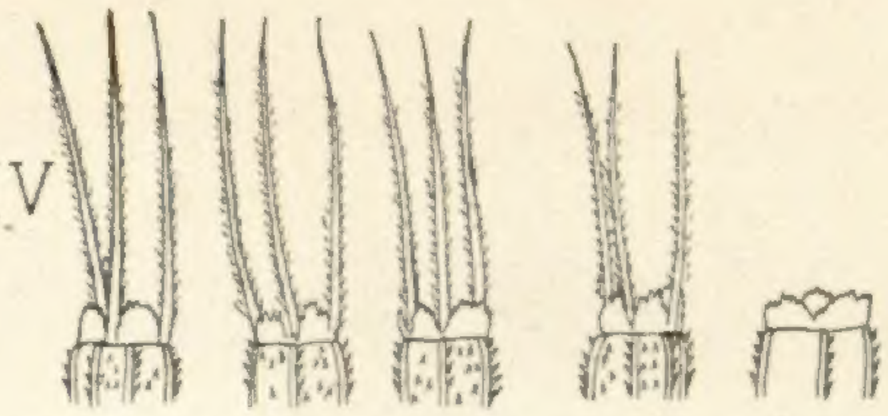
I

II

III

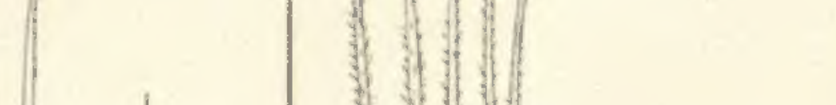


IV



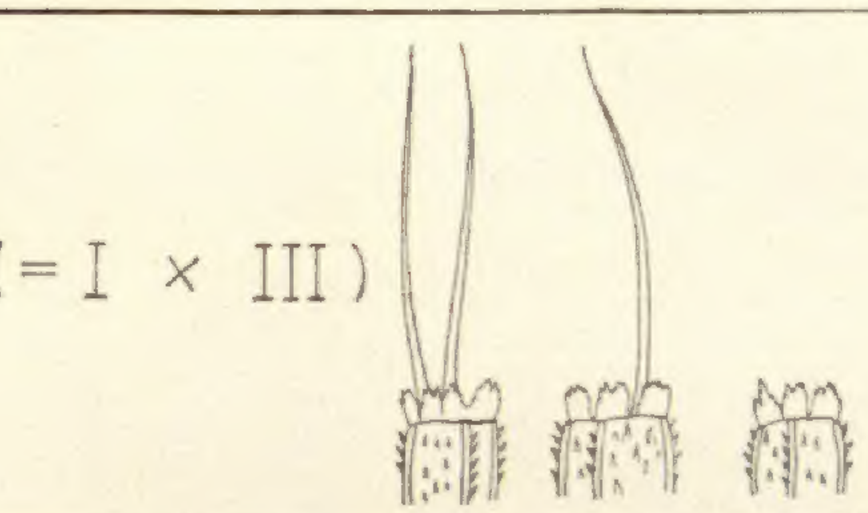
V

VI

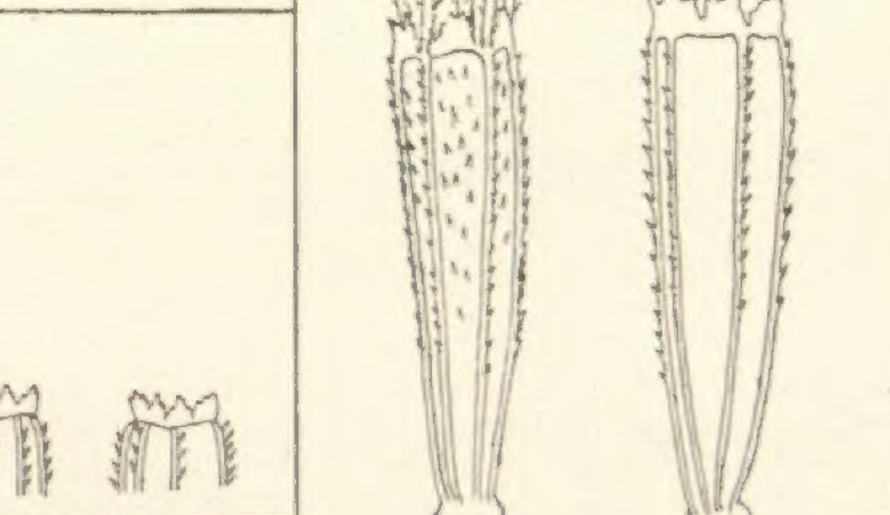


VII

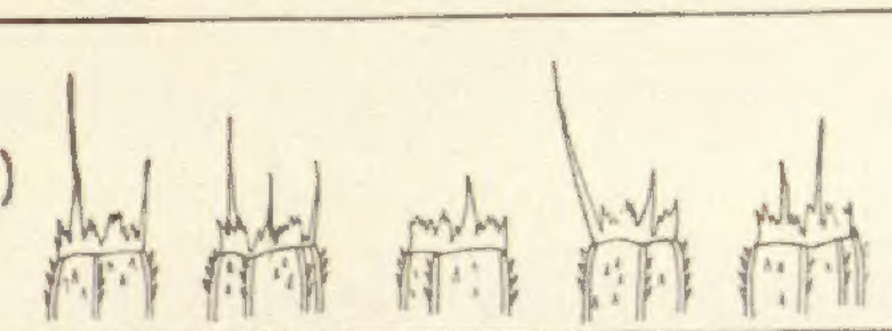
VIII



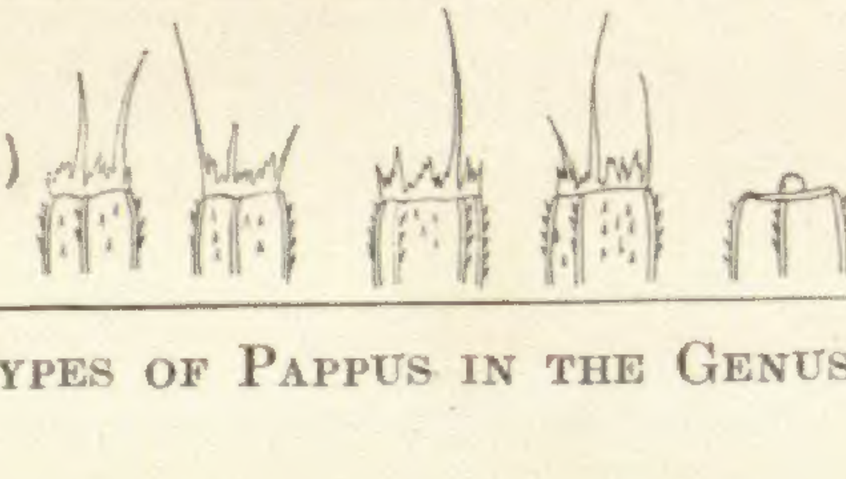
IX



X (= III × IV)



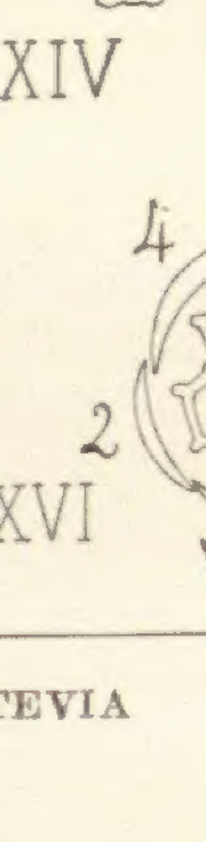
XI (= I × III)



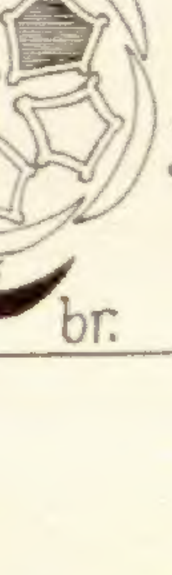
XII (= III × V)

XIII (= IV × VI)

XIV



XV



XVI

TYPES OF PAPPUS IN THE GENUS STEVIA